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COAL AGE

JANUARY, 1961

Thin-Seam Deep Mining . . p 72
Twin-Head Strip Drill . . . . p 78
Plant Maintenance . . . . . p 87

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COAL...

60 61

What Happened in 1960

What's Ahead in 1961

coming and going

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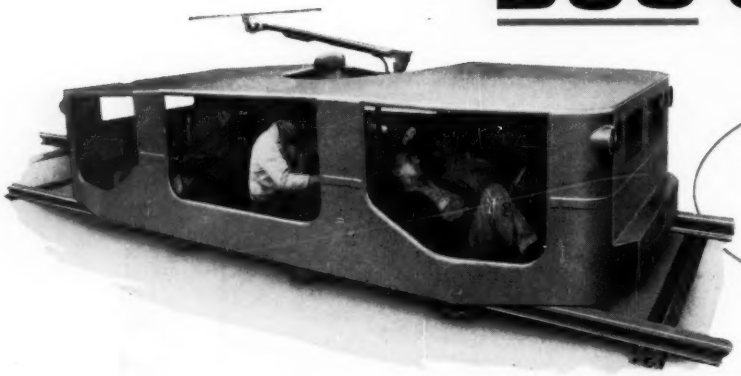

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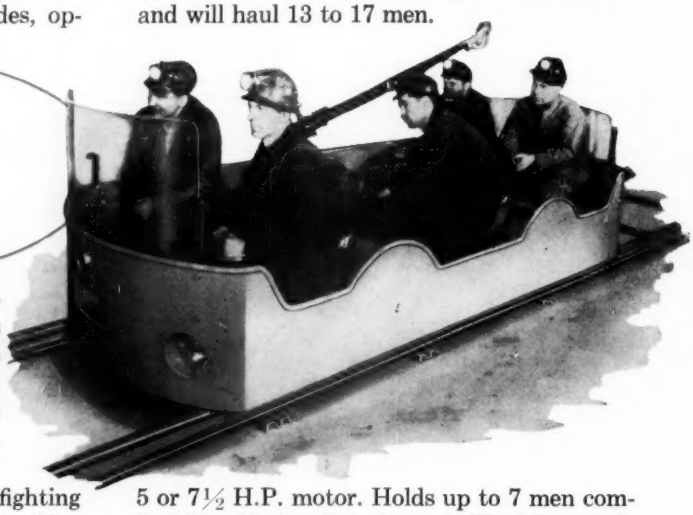

■ The Mine Jitney is the "Jack-of-all-Trades" of the mine fleet because its versatility enables it to be used on the regular job and for emergency. It can handle the job of furnishing fast, safe transportation of key personnel, maintenance crews and special groups; and can double up as an ambulance or fire-fighting equipment car. Designed with twin braking systems for added safety. Powered with either 5 or 7½ H.P. motor. Holds up to 7 men comfortably. Optional equipment: Plexiglas windshield, fire extinguisher, stretcher equipment.

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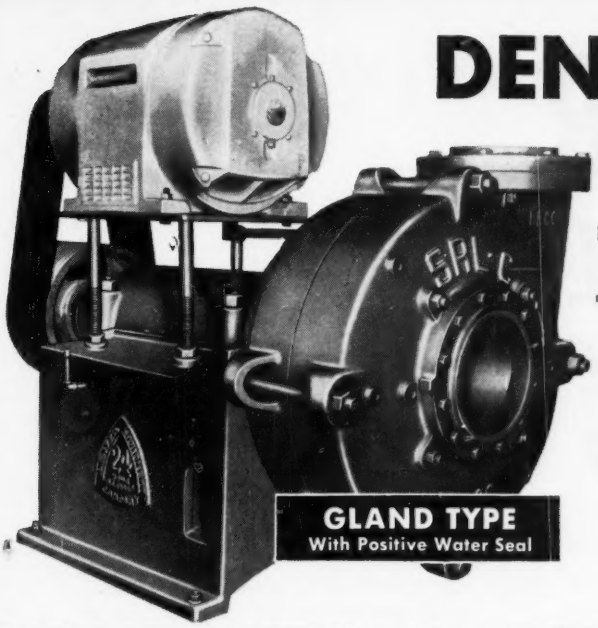

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1¼"x1"	2000	1.1	30	20	12½	13	135
1½"x1¼"	1790	2.2	70	25	17	19	300
2½"x2"	1600	5.2	170	25½	17½	19½	325
3" x3"	1520	8.6	300	31¼	19¾	21	500
5" x5"	1190	25.3	1000	37¾	26¼	30	980
6" x6"	1125	30.3	1400	45¼	28½	33	1320
3" x3" —C	1550	8.4	300	37½	21½	23	780
5" x4" —C	1145	16.3	700	40¼	27	29	1200
8" x6" —C	882	29.5	1400	57	36½	38	3000
10" x8" —C	770	61.0	2900	64¾	43	44	4000
12" x10"—C	615	96.0	4600	69¾	46½	49	5300
"TRU-GLANDLESS" Type (TG)							
1¼"x1" TG	2000	1.1	30	20	12½	13	135
3" x3"—C TG	1550	9.4	300	37½	21½	23	780
5" x4"—C TG	1145	18.3	700	40¼	27	29	1200
8" x6"—C TG	882	33.0	1400	57	36½	38	3000
10" x8"—C TG	770	70.6	2900	64¾	43	44	4000

*Based on water. Multiply horsepower by specific gravity of pulp to obtain actual brake horsepower.

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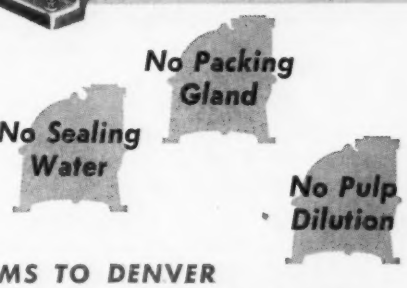

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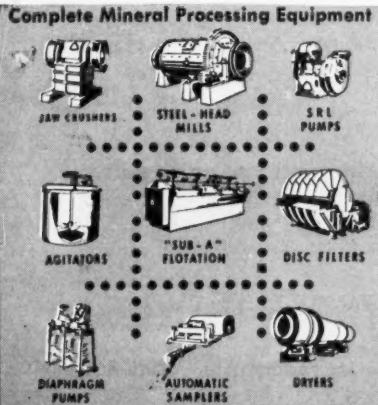

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This Month in COAL AGE

JANUARY, 1961

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► Economic Review

The 59-60 Coal Picture ..... *p 60*

In terms of coal production, 1960 was about level with 1959 in bituminous. Anthracite showed another decrease of approximately 15% in 1960—down to an output of 18 million tons. Circumstances as reflected in the level of general business indicate that bituminous is marking time prior to an upturn; anthracite will suffer further losses.

Natural gas is providing coal—and oil—with rugged competition. However, the consensus is that coal can hold its own, especially in steel and the utilities.

Special—Roundup of coal's prospects in major markets.

► Operations Review

Mining, Stripping, Preparation in 1960 .. *p 64*

Acceleration in the development of equipment for efficient thin-seam mining was a trend much in evidence in 1960. Wide acceptance of differential-rate feeders contributed to higher efficiency at the face by increasing the number of shuttle-car payloads per shift.

In stripping, big news was made in 1960 in the announcement of the sale of a 115-cu yd shovel for use in Kentucky, and in the successful application of a twin-head sidewall drill which produces two 12-in blastholes simultaneously.

Increasing use of heavy-medium washers and an influx of nucleonic controls to maintain medium density marked preparation activities in 1960.

► Mining

Deep Mining Thin-Seam Coal in Eastern Kentucky ..... *p 72*

Kentucky ranks third in the production of coal in the U. S. The eastern field—a part of Dist. 8—produced approximately 58.2% of the state's total production—66,311,805 tons in 1958. The eastern field produced better than 39½ million tons. It is remarkable that of this amount 2,473 underground truck mines accounted for 13½ million tons with a total employment of 17,966 men, while 128 rail mines produced some 22 million tons with 12,362 men. The small mine accounted for 34.3% of eastern Kentucky's production, 89% of the number of mines and 56.2% of mine employment. These figures point up the fact that truck mining is big business and that it plays an important role in the economic structure of eastern Kentucky. For the most part, special equipment and unorthodox methods are used to produce coal economically. This feature describes two operations in the heart of the truck-mine field.

Geographical Information—Map shows eastern Kentucky's Dist. 8; counties included in the district; areas of major coal deposits; and locations of rail mines.

(*Continued on page 7*)

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Pump Monitoring and Control—Provides centralized indication and control of pump operation. Requires a two-wire parallel circuit, which may be integrated with circuit for Femco 709 system.

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COMMUNICATIONS: Carrier and wired audio systems for all mining and industrial applications. **MONITORING:** Fans, circuit breakers, valves, pumps, compressors, etc. **TELEMETERING:** Flows, pressures and other functions. **REMOTE CONTROL:** Pumps, valves, circuit breakers, soaking pit covers, furnace doors, cranes, or other moving equipment.

► Strip Mining

Twin-Head Giant Broadens Drilling Horizon at Power Mine ..... *p 78*

Ability to drill two holes simultaneously, penetration rates up to 45 fpm in shale, independent positioning of drill masts and remote control of drill operation are major features of a new rotary dry-type sidewall overburden drill in service at Peabody Coal's Power mine, Montrose, Mo. Three 30-ft drill steels are carried in each mast to provide a maximum penetration of 90 ft. The drill has demonstrated its ability to bore well over 2,000 ft of 6¾-in hole per shift at Power mine.

Of Prime Interest—What the drill looks like; how it operates; drilling results.

► Face Preparation

Automatic Delay Shooting With Air ..... *p 84*

New-type automatic discharge heads combined with sequence valves make it possible for the shooter to break a cut of coal in 3 to 5 min less time at Freeman No. 4 mine, Marion, Ill. And he makes only half as many trips per cut. The automatic discharge head resets itself and eliminates the need for slugs or nails, which were used in old-type shells.

Extra—Series of on-the-site photographs.

► Maintenance Ideas

Preparation-Plant Maintenance Program . *p 87*

The growth in new-plant construction, mass modernization programs to improve plant efficiency and products, and the never-ending program of up-dating equipment and methods to keep ahead of market demands certainly suggests that an evaluation of your preparation-plant maintenance program is necessary. This feature lists and describes the steps necessary to evaluate your program.

Evaluation Helper—How reports and records simplify evaluation process.

► Accounting

Computer Improves Shipping .....*p 92*

Ralph E. Rose Jr., Manager, Data Processing Dept., Clinchfield Coal Co., Dante, Va.

Random-access electronic computing equipment and teleprinting communications network permit rapid processing of coal-shipment details, from orders on punched tape to printed shipping instructions. The system will increase in value as Moss No. 3 mine expands to maximum production. Other uses include payroll accounting and calculation of surveyors' traverses.

Recipe for Low Cost—Modern data processing saves time and labor.

This Month in COAL

SLOW START—The weekly production rate in December, 1960 wiggled around between 6½ and 7½ million tons, dropping output for the year below the 1959 total of 412 million. And while production was dropping, stockpiles were climbing steadily to reach a probable 3-yr high. Though it is expected that the weekly rate will strengthen in January, it still quite likely will be not much over 8 million a week compared to nearly 9 million in January, 1960.

Anthracite—The December blizzard in the East boosted the hard-coal rate temporarily, but not enough to bring January up to January, 1960. In fact it probably will be well under, barring another protracted cold spell.

IN WASHINGTON—A new administration of the opposite political faith takes over this month and brings with it the question of what it will do in the realm of business, including coal. As has been noted here on previous occasions, the pressure will be to up spending since if the administration attempts to live up to the Democratic platform—and has any success—that is inevitable. The "liberal" approach also calls for more government rather than less in private business, and for more regulation and restriction of the private sector. The Kennedy promise of help for areas of unemployment, particularly coal unemployment, will be translated into some form of action. In fact, some steps already have been taken. The question then becomes how effective, not to mention how costly. More preference for other countries in foreign trade controls is a strong possibility.

IN CONGRESS—Though there were a few individual shifts, the makeup of Congress is substantially the same as it has been, with the result that, in spite of the fact that the new administration is now Democratic, the Congress will act pretty much as it has before—thus probably constituting a brake on the more far-out ideas of either the administration or congressmen and senators with advanced "liberal" tendencies. It will tend to favor any programs aimed at reducing unemployment temporarily and over the long run but may not show any more disposition to push through a national fuels policy resolution, tax relief and the like than other recent Congresses.

PRICES AHEAD—Low tonnage keeps the pressure on realization, which declined again in 1960. The situation for at least the first half of 1961 promises to be much the same. So some further retreat is in the cards, with the question whether further cost cuts will offset the concessions and thereby preserve the profit margin. The 1960 results indicate that this is a likely result.

INDUSTRY STANCE—Along with all the others one of the big present questions probably is the attitude the bituminous industry should take toward the present situation. It is easy to look back and see where overoptimism set in. Is it now possible that the pendulum has swung too far to the other side and that excessive pessimism is the order of the day? That is the question some industry leaders pose—probably with some justification. The right balance, they point out, is the thing to seek after, since excess on the down side can be as much of a handicap as on the up.

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► Electric Power

Trends in Open-Pit Mine Power Distribution ..... p 96

A. C. Lordi, Mining Industry Engineer, Westinghouse Electric Corp., East Pittsburgh, Pa.

To supply the large fluctuating loads represented by the new large stripping machines requires that power-distribution systems be planned more carefully than ever before. Safety, capacity, flexibility, equipment protection and voltage regulation become increasingly important. The author discusses factors to be considered in selecting and applying each component in a power-distribution system.

Highlights—Line drawings of power-distribution systems and components.

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This Month in Mining Practice

STILL A FACTOR—How many new mines may be opened or started in 1961 still is a question. Even though tonnage may not move up appreciably, which now seems the situation, there probably will be an increase in the number simply because the low rate of 1960 cannot be maintained. What will be the basic equipment for the new underground operations? The majority will use continuous miners, but the conventional cutter-drill-loader setup will be called on in a significant number of instances. This may be concluded because, among other reasons, such units still rank high in the list of equipment receiving permissible plates.

TONS PER MAN—The washing out of low-efficiency properties, improvements in equipment at mines retained in operation, and the contributions of new facilities continue to up productivity per man. The estimate for 1960 is 13.0+ tpm, compared to 12.22 in 1959. Ahead in 1961? Quite probably another rise of a full ton per man or more, bringing the rate to 14 or better—and also making the breaking of the 15-ton barrier an immediate possibility.

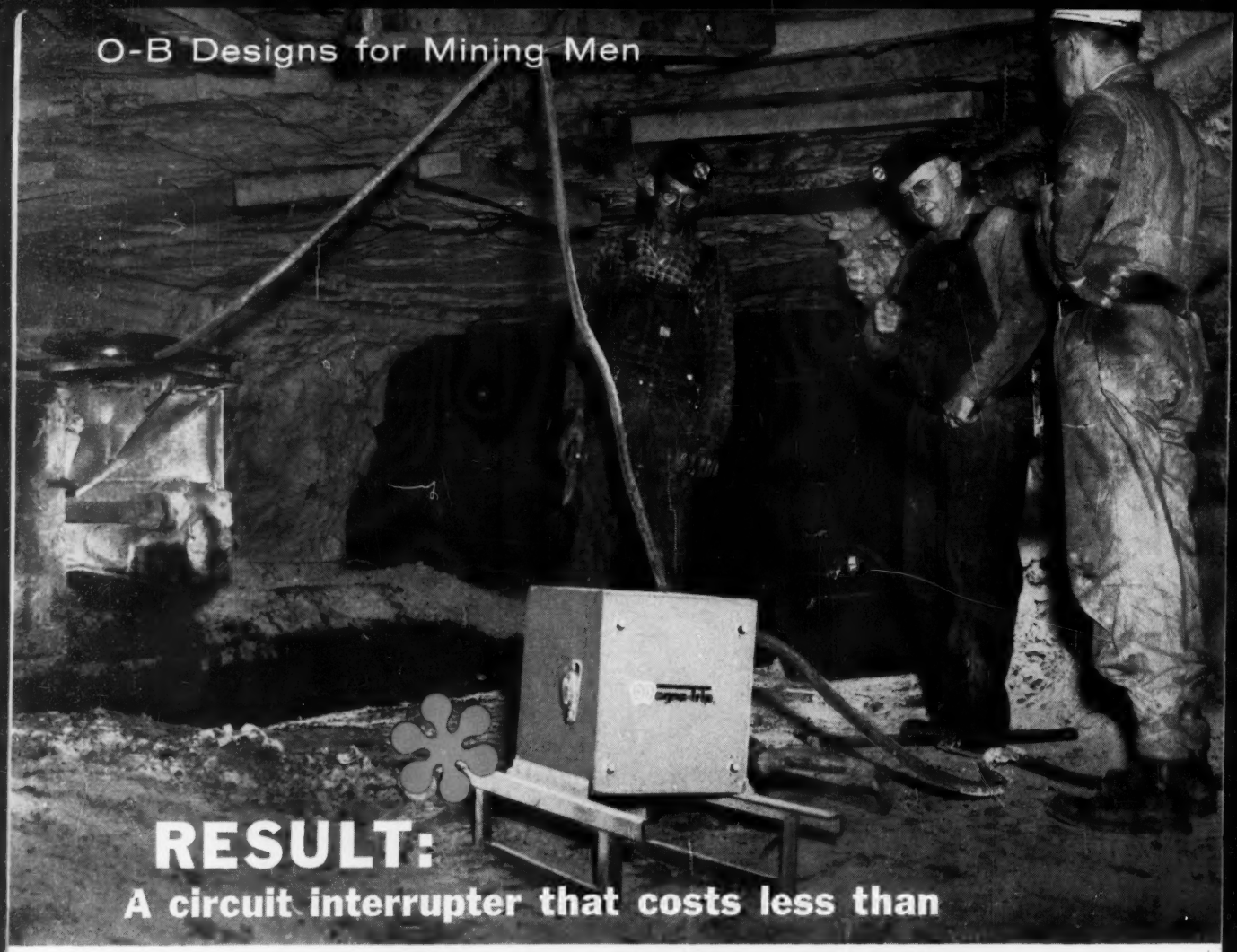
SPOILING BY SHOOTING—Though the practice of spoiling by blasting goes back a number of years on a limited scale, the use of low-cost ammonium-nitrate is broadening its use. The biggest opportunity is in hillside or contour work, but additional study and experimentation are resulting in increasing consideration for flat-country work with certain overburden conditions. Look for the practice to grow.

TRAILING CABLES—The critical role of the trailing cable in mining operation is reflected, among other things, by the recent action of the Bureau of Mines in approving use of lengths over 500 ft on underground units. As new mining units and systems are worked out the pressure for further extensions will grow—and will present manufacturers and users with some engineering and use problems. As time goes on and more horsepower is put in machines, the day when voltage probably will be upped is brought closer and closer.

BULK HANDLING—Again not a new idea but nevertheless one that so far has seen only limited use is the prepacked or prepackaged supply bundle—now the key ingredient in the new "bulk-handling" concept. Simplicity and economy are significant benefits, with spreading of the system a logical consequence in underground mines in particular.

AHEAD IN ROOF SUPPORT—The roof bolt still holds the lead as the chief means of roof support in coal mines, with single posts and crossbars second and third. Gluing roof members together still is being researched and the use of yielding props and arches is growing, with the yielding prop being found especially helpful in pillar work in the experience of some operating men. For temporary support the face shield still is being studied and may eventually find actual mining application on some scale. Out of all the work being done on support it may be possible eventually to get the cost down significantly from its present 30 to 50c or more per ton.

O-B Designs for Mining Men



RESULT:

A circuit interrupter that costs less than any other type of cable protection... except the fuse!

MAGNA-TRIP SNUFFS OUT SHORTS BEFORE THEY HAVE A CHANCE TO CAUSE TROUBLE. Ingenious design by O-B engineers results in a simple sturdy unit to protect machines, cables, and men. This safe control-device drastically reduces the danger and expense of cable fires.

VITAL MINING MACHINES PRODUCE MORE WHEN THEY'RE PROTECTED WITH MAGNA-TRIP. This efficient unit reduces damage resulting from shorts and faults in cables. Less damage means less lost labor . . . less lost time . . . less lost production on your jobs.

WHEN IT TRIPS . . . THERE'S TROUBLE. Magna-trip has been designed to allow for normal surge loads without "false tripping." When Magna-trip kicks out . . . there's trouble on your circuit . . . and you've saved damage and delay!

PAYS FOR ITSELF WITH THE FIRST CABLE IT SAVES . . . ALL OTHERS ARE PROFIT. Magna-trips cost less than the ordinary length of cable that it protects. The **first** time that it saves a cable that would otherwise have been destroyed . . . you've paid for your circuit interrupter. In its lifetime, your Magna-trip will return to you its cost many times over.

OHIO BRASS COMPANY, MANSFIELD, OHIO, Canadian Ohio Brass Company Ltd., Niagara Falls, Ontario.

Magna-trip keeps big machines moving . . . saves cables . . . protects equipment. Units are available in 100- and 300-ampere sizes for 250 or 600 volt circuits . . . All are compact, sturdy, reliable.

Ohio Brass

HOLAN

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

10052-M

The Coal Commentator

More Payoff

The year 1961 will be the third low year in a row for bituminous. This does not, however, as pointed out in the review and outlook material elsewhere in this issue, warrant any general feeling of pessimism. However, it will place an added premium on cost reduction and quality improvement, not only for the present but for greater progress when the upturn comes.

Equipment remains the big item in cost reduction and quality enhancement, but it isn't everything. An equally important ingredient is brain sweat, which paves the way for getting the ultimate out of facilities and methods. Taking thought, studying the record and applying the principles of industrial engineering and operations research can result in impressive savings without any particular investment in new equipment—though the end result may be that new equipment would provide benefits that would make its purchase mandatory.

Now is when the cold, analytical look at equipment and methods will pay off more than ever.

New Prize

The direction population growth is taking in the U. S. is shown in part by the number of cities that have reached the 100,000-population mark in the 10 yr since the last census. The total is 27, but one of the interesting things about them is their location. Twenty-one, or nearly four-fifths, are in the southern tier of states across the country from the Atlantic to the Pacific.

This highlights the growth in population that has taken place in the South, Southwest and Far West—some natural and some the result of migration from other areas. The southern tier has been traditionally the oil and gas belt, but now the region of these two fuels is being challenged more and more by coal as energy needs rise and oil and gas prices continue to climb.

The trend should strengthen as time goes on, and it may well be that coal reserves contiguous to these areas will become somewhat of a prize for enterprising operators. Most certainly interest and exploration has turned up sharply in the past year.

Beef Needed

A recent British discussion of single-rail supply carriers, with the rail either on the bottom or suspended from the roof, throws some light on the equipment necessary for transporting supplies and machine parts underground. The discussion comes from Great Britain, where experiments with both types of monorails are being conducted.

One conclusion is that the overhead monorail is more flexible as well as simpler but even it cannot handle heavy components or assemblies for face units. **Track it is concluded—or some other form of wheeled or crawler transport—still is essential for heavy items, though the monorail may be a helpful adjunct under certain conditions.**

Not So

Your commentator recently had the pleasure of being a member of a panel presenting the oil, natural-gas and coal cases to the New York Chapter of the National Purchasing Agents' Association. It was an interesting experience, marked, among other things, by restraint on the part of the oil representative and a wild-blue-yonder job by the gas protagonist, who wound up with an attack on coal for proposing study of the desirability of a national fuels policy. **He repeated the myth that such a policy would involve allocation of markets and declared that the gas industry's desire was that free competition determine each fuel's share of the energy total.**

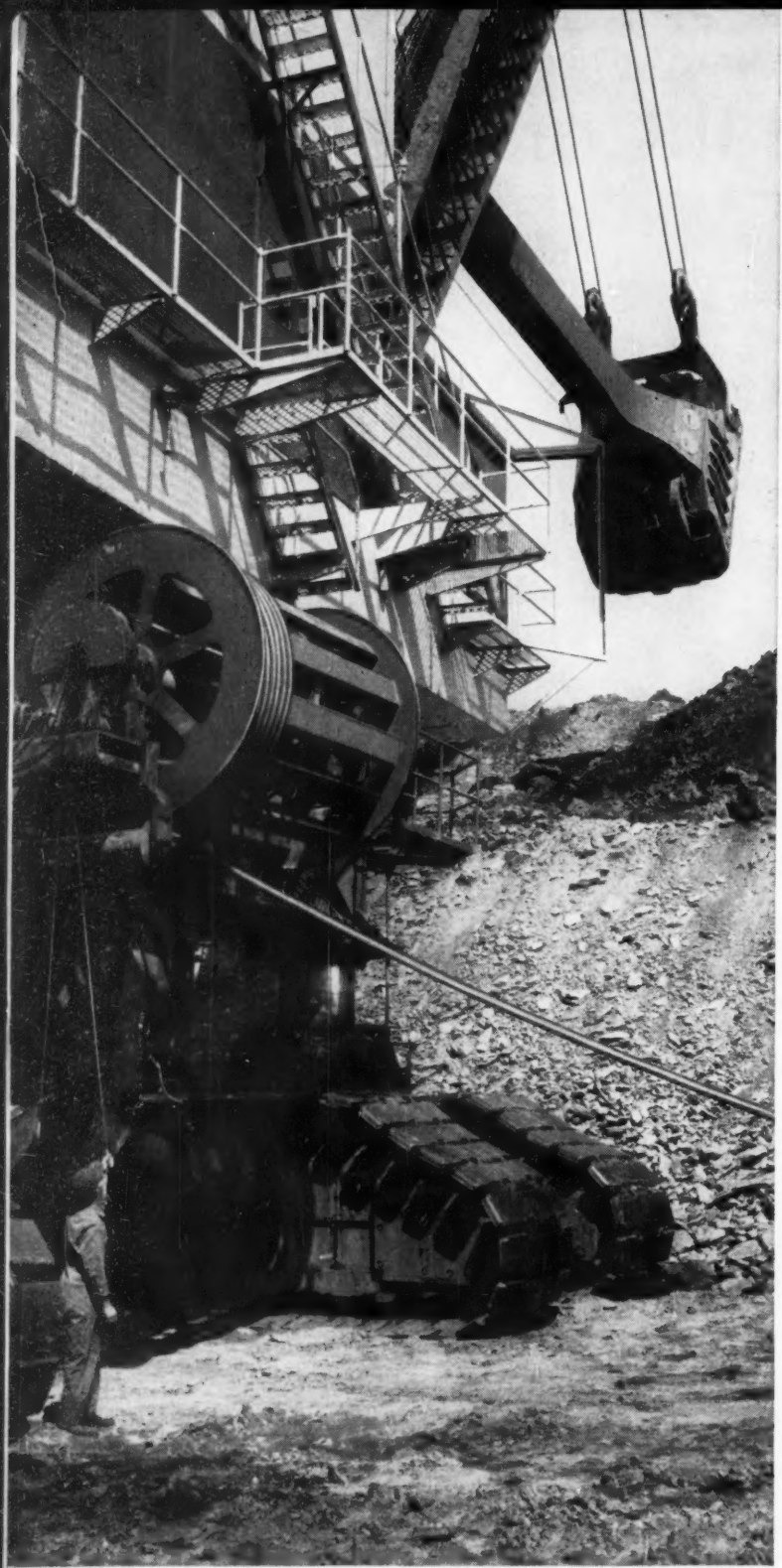
"Maybe," is your commentator's reaction. When the government and the courts favor your competition you tend to get a little concerned. When this favoritism takes the form, as it did not so long ago, of forcing a pipeline concern to cut its offer for gas by 6c per M, the difference is $1.50 against coal and it can hardly be said that there is free economic choice. **Pious protestations to the contrary natural gas has been benefitting from major governmental favoritism in wellhead price controls and in other ways also. Coal of necessity must fight when situations such as these exist.**

Full Remote

Mining by remotely controlled machines has been an experimental and to some extent operating reality for a number of years. It now appears that it could soon become a commercial reality in that equipment will be available to any and all prepared to operate from strip pits or specially prepared hillside benches.

It should be noted that so far control and operation still are on the outside, one reason being the physical size of cable- and conveyor-storage facilities. Engineering, however, is the answer to size problems and there is every reason to believe that such engineering will yield results in due time. So, it can be assumed that in, say, 5 yr or so equipment and a system will be ready for underground trials. And when it is perfected it will really be a big step ahead in efficiency and safety in underground mining—perhaps even making it competitive with stripping across the board.

In short, full remote-control mining will be, if not the ultimate, the next-to-ultimate step in deep mining, bringing with it the near-ultimate in cost reduction.



MOUTHFULS UP TO 100 TONS. The Midland shovel—one of the world's largest electric shovels—is shown removing overburden at the Midland Colleries, Inc. open-pit mine at Victoria, Illinois. Raw coal is then picked up by smaller shovel, and shipped to terminal points for processing, before being sent to industrial and electric-utility users in Illinois and Iowa.

Okocord gives Midland giant its "bite"

It's giant, all right. A shovel as tall as a 14-story building . . . weighing 2900 tons . . . capable of gobbling up 70 cubic yards of earth and rock at every bite. And its giant appetite for power — at 7200 volts every second of every day — is supplied by tough, flexible Okocord cable.

The shovel is one of the five largest power shovels in the world. Owned by Midland Colleries, Inc., and operated at their open-pit mine in Victoria, Illinois, it strips away soil, shale and rock to expose the coal bed 50 feet below the surface. Snaking behind it is the 1000-foot Okocord lifeline that connects the giant's motors to a terminal box on the surface.

Midland Superintendent Charles German sums up what he desires in a cable in one word: "Durability." Each day the cable is twisted, scraped across coal deposits, exposed to heat and dampness — without downtime.

What Okocord does for the Midland shovel, it can do for *your* machines, large or small. Okocord's durability—the result of its toughness and flexibility combined with excellent resistance to moisture, heat and corona-cutting—makes it a wise investment for trouble-free mining operations. This is Okonite Cable'bility* at work. For complete details write for Bulletin CA-1108. The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

*OKONITE Cable'bility . . . cable craftsmanship since 1878

***where there's electrical power... there's* OKONITE CABLE**

8142

NEW!

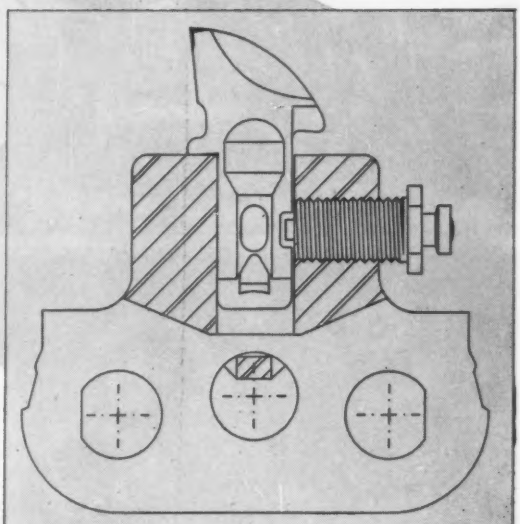
RSS QUICK CHANGE Cutter Bit slashes bit changing time 85%

For fast, easy bit changing, try the new Carmet® RSS Quick Change Cutter Bit with keepers in JOY V-type chains. Simply pry set screw plunger outward to retracted position (cutter bit is released instantly)—remove bit with free hand—replace bit—release plunger. Changing time is reduced 85%! Bit changes are just as fast in Bit Rings and Borer Blocks.

RSS Cutter Bits are designed for positive locking with JOY keepers. The threaded keeper plunger engages a forged notch in the tool shank, keeps the cutting tools locked firmly in place. No wobble, no battering of tool shank on keeper, no tools jerked out and lost.

And the RSS Cutter Bit is built to take abuse . . . with a beefed-up, load-bearing shoulder area that withstands higher cutting pressures . . . a plug-type carbide insert set at an angle that eliminates braze failure and insert loss . . . a full radius tip design that fully supports the insert, reduces breakage, permits harder grades of carbide.

The carbide, of course, is Carmet carbide . . . famous for quality. In fact, Carmet Division manufactures the complete mining tool, and their reputation depends on Carmet Tools being the finest available. There's a Carmet Bit designed for universal machines and continuous miners of every make, and your Carmet distributor carries a complete line in stock for prompt delivery. Call on him for help with your mining tool problem. ***Allegheny Ludlum Steel Corporation, Carmet Division, Ferndale, Detroit 20, Michigan.***



NEW BIT AND KEEPER COMBINATION
FOR JOY V-TYPE RIPPER CHAINS
FEATURING THE CARMET
RSS QUICK CHANGE CUTTER BIT

2377

NEW CARMET MINING TOOL CATALOG NOW AVAILABLE

For your copy, contact one of these Carmet distributors or write Carmet direct.

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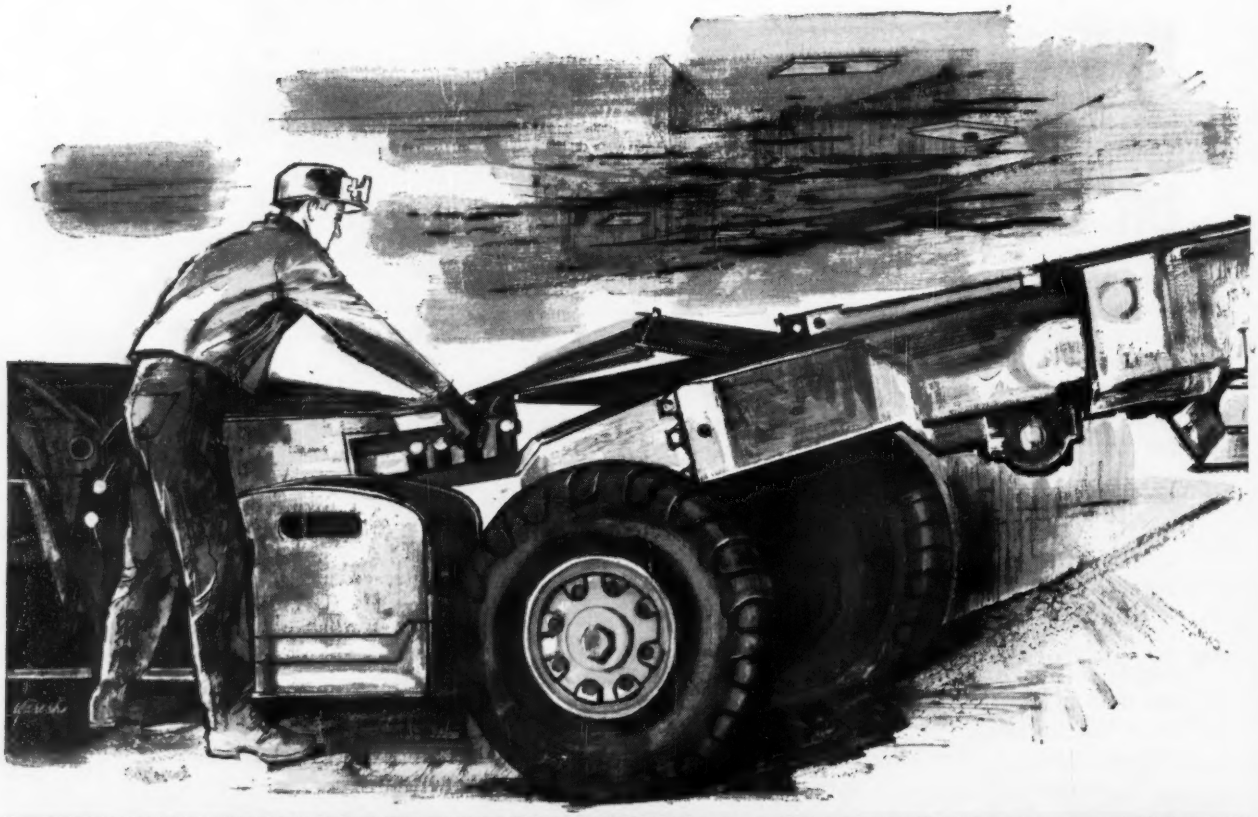
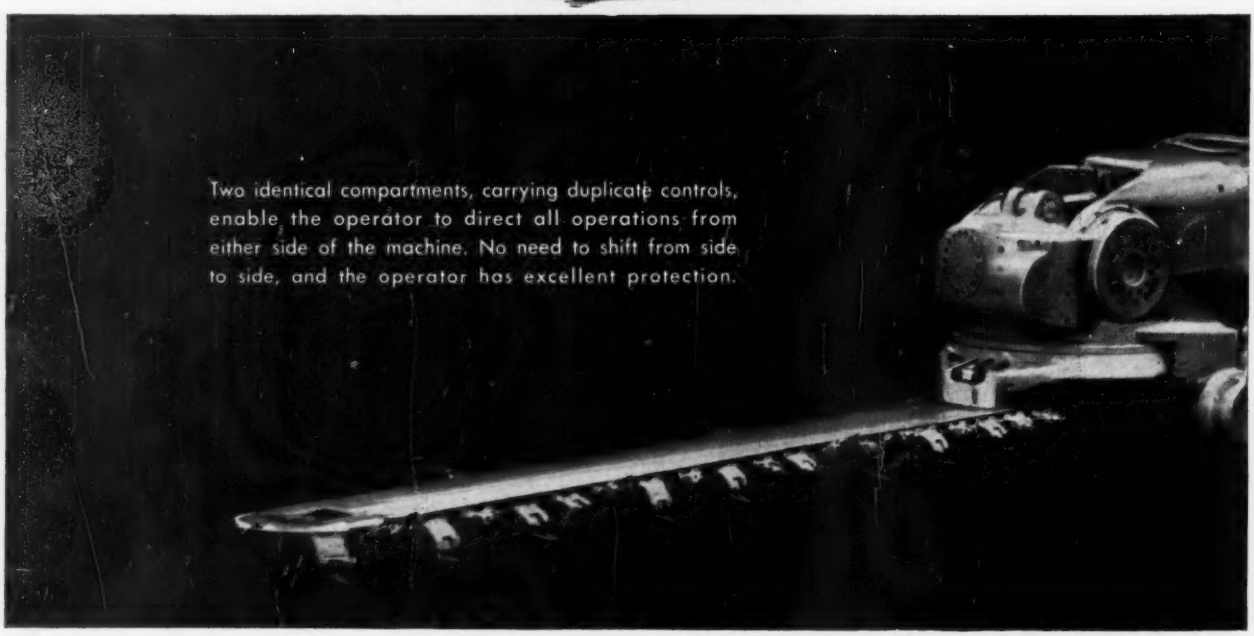
CARMET® AL
CEMENTED CARBIDE • DIVISION OF ALLEGHENY LUDLUM

JEFFREY UNIVERSAL COAL CUTTERS . . .



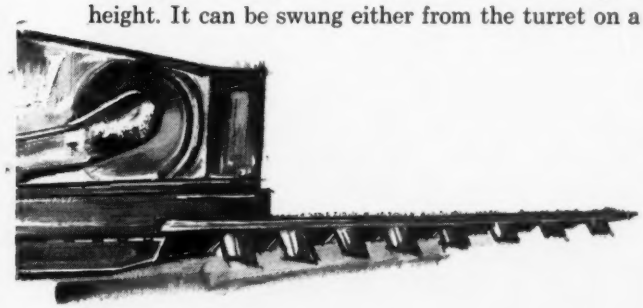


Two identical compartments, carrying duplicate controls, enable the operator to direct all operations from either side of the machine. No need to shift from side to side, and the operator has excellent protection.

cut any place in the seam from 14" below floor level to 13' above

Jeffrey Universal Coal Cutters (AC or DC) are designed to meet various mine conditions and are available for working in mines with seam heights ranging from three feet to thirteen feet.

Jeffrey cutting machines mounted on rubber tires have a cutting head which can rotate and is instantly adjustable in height. It can be swung either from the turret on a long radius



or from the cutter head on a shorter radius. This permits bottom or top cutting any place in the seam or for making a shear cut right or left of center.

These machines feature the latest developments in coal cutting efficiency to give more workability without breakdowns... important advantages in getting higher production.

ADVANTAGES

1. Full hydraulic control of all operations except cutter chain drive
2. Easy to operate and control—giving quick response from fingertip controls
3. Built for safety and speed
4. Designed for hard cutting
5. Constructed to stand up under rugged going
6. Have maximum flexibility and low cost operation—no operating time wasted
7. More smooth cuts per shift
8. Operating and control mechanisms are accessible for maintenance

JEFFREY

THE JEFFREY MANUFACTURING COMPANY
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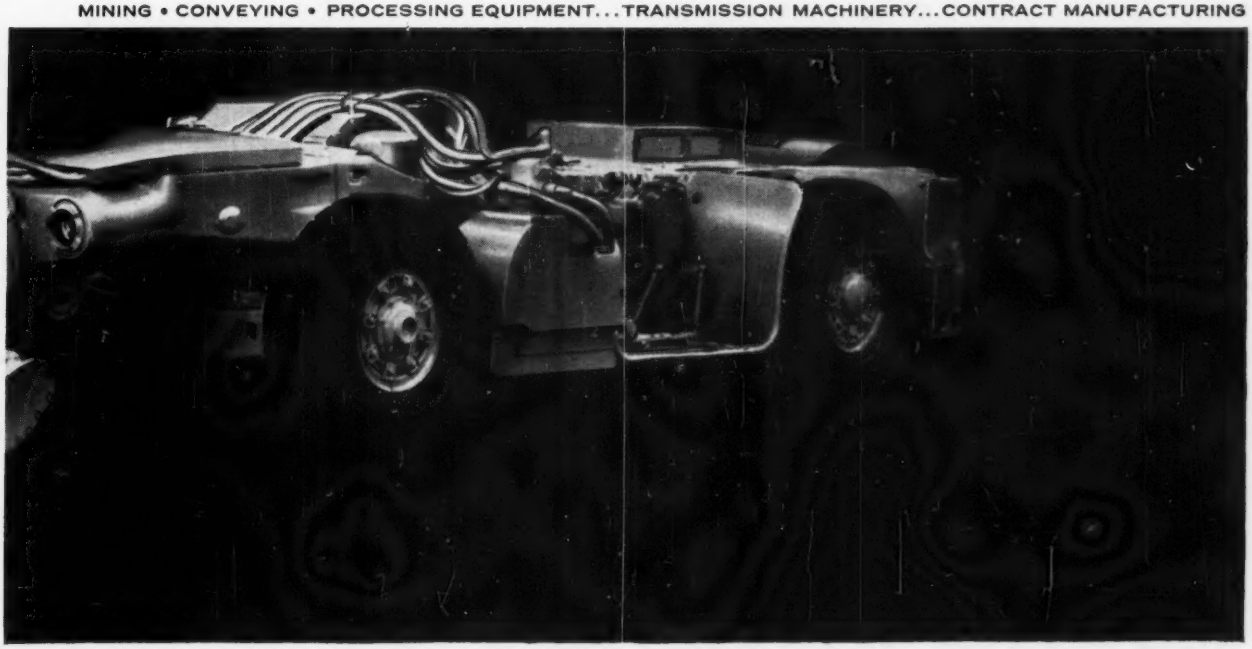
Columbus 16, Ohio

MINING • CONVEYING • PROCESSING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING



KENNAMETAL AUGERS meet all roof drilling conditions

Kennametal makes augers for various roof drilling methods—rotary and rotary percussion augers as well as augers for use with internal dust collection systems. Kennametal roof drilling augers can be ordered with full scroll, partial scroll or no scroll. Shanks on Kennametal Augers will fit any roof drill . . . and any standard roof bit will fit the auger chucks.

In addition to a *complete* line . . . Kennametal has a *top quality* line. The bodies of all Kennametal Roof Bolting Augers are made of high-strength, aircraft-quality steel tubing . . . to resist bending or breaking under the heavy strains imposed by modern roof drills.

Remember, one auger may *look* like another but . . . the difference shows up in performance. Your Kennametal Representative will gladly supply you the Kennametal Augers and Kennametal Drill Bits that will perform best in *your* mine. Call him, or contact us direct. KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania. Phone Bedford 755. 33570

INDUSTRY AND
KENNAMETAL
...Partners in Progress

How far will a Yieldable Set yield?

In any discussion of the Yieldable Arch or Ring, the question is invariably asked: How far will the Arch yield? Answer: It is not unusual to have a Yieldable Arch set yield until the legs almost touch each other at the center.

Gives Ground Chance to Settle

That's the whole point of the Yieldable Arch; it is *normal* for the joints to yield. It's the old technique of letting the enemy beat himself. By gradually "giving" under excessive pressures, the Arch gives the overburden a chance to settle into a natural arch of its own, and thus bring forces into equilibrium. As soon as stability is reached, the Yieldable Arch holds the line. A set of Arches consists of curved, U-shaped sections nested together and overlapped enough to permit clamping with two U-bolt clamps at each joint. The clamps control the degree of tightness, and permit yielding when the forces exceed the load for which the joint was intended. Each Yieldable Arch set is tied to adjoining sets by means of horizontal struts, which add lateral rigidity to the structure.

Usually Pays for Itself in a Year

Besides increasing mine safety, the Yieldable Arch offers high salvageability, and usually pays for itself within its first year of service. A Bethlehem engineer would like to discuss the application of the Arch to your roof problems.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Hulburt Lubricants provide proven

PREVENTIVE MAINTENANCE

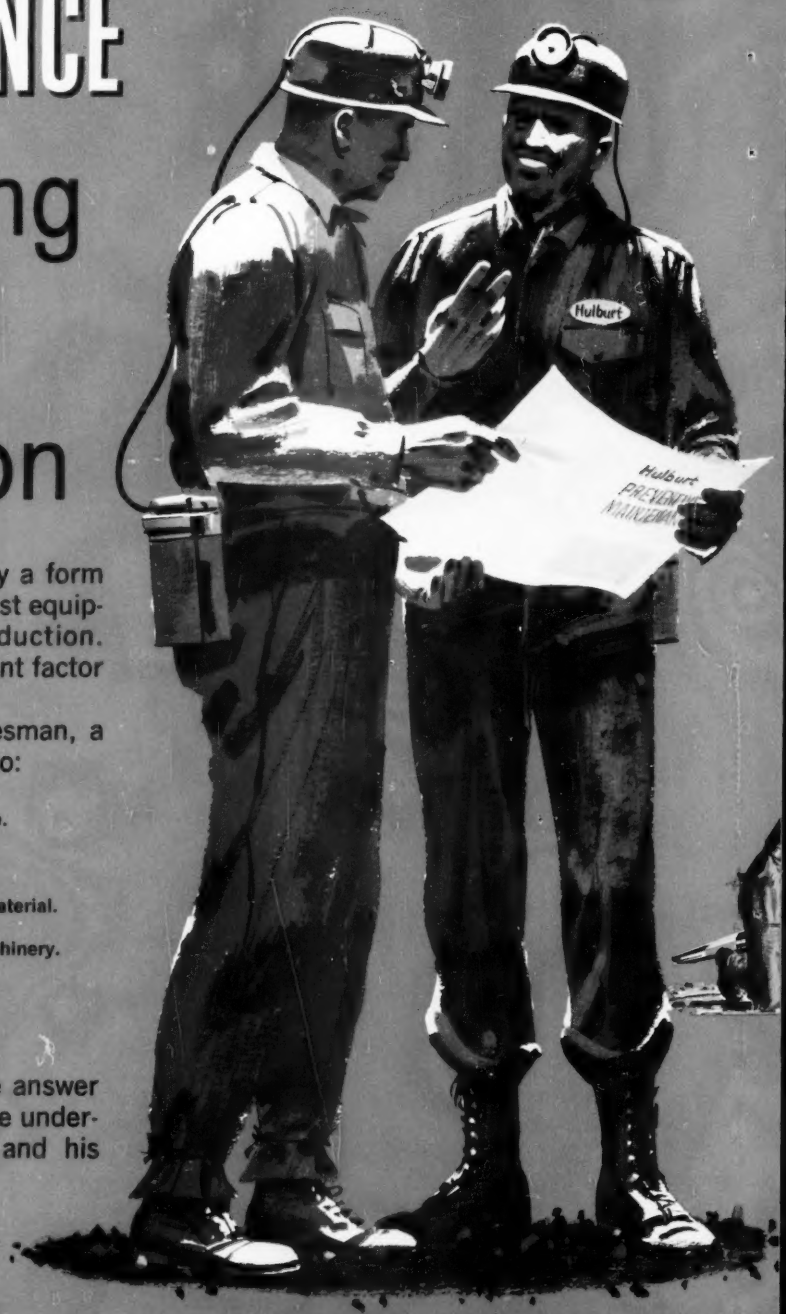
...assuring low-cost production

Preventive Maintenance is simply a form of maintenance that guards against equipment failure during actual production. Hulburt lubricants are an important factor in Preventive Maintenance.

Why not ask the Hulburt salesman, a mining lubricant specialist, how to:

1. Attain minimum production downtime.
2. Reduce major repairs and overhauls.
3. Cut maintenance costs—labor and material.
4. Get more efficient response from machinery.

The Hulburt salesman knows the answer to the above questions because he understands **Preventive Maintenance** and his products provide for it.



HUL-E-MUL

FIRE-RESISTANT HYDRAULIC FLUID

Almost every day another mine turns to Hul-E-Mul and for good reason.

Final hydraulic cost per ton is lower with Hul-E-Mul than with any competitive hydraulic lubricant on the market. This sweeping statement includes any conventional hydraulic oil or competitive emulsion.

You handle Hul-E-Mul just as you now handle your conventional hydraulic fluid. Hydraulic performance—pump life and machine efficiency—is generally improved with Hul-E-Mul.

Proof of the pudding is the fact that coal mines are no longer just "testing"; but on the basis of test results, they are changing over 100% to Hul-E-Mul as fast as possible to achieve greater economy and better hydraulic performance.

When ordering Coal Mining Lubricants

you can't be wrong in specifying Hulburt

HULBURT OIL & GREASE CO., PHILADELPHIA 34, PA.

Specialists in Quality Lubricants for the Coal Mining Industry

operators report on SEPARAN AP30 flocculant

Here are reports of results from a few of the many operators who have shifted to Separan® AP30 flocculant. Notice the important savings in material costs, the improved wash water clarification and the increased capacity of existing equipment.

A Kentucky coal company found that Separan AP30 made possible satisfactory clarification of wash water without adding expensive new equipment. Using starch, an overflow of clear wash water could not be maintained past mid-morning on Monday, after the normal weekend shutdown. When a 0.05 per cent solution of Separan AP30 was substituted, clear water was maintained at an average depth of 42 inches in the thickener during the entire workweek.

In one 18,000 ton-per-day plant, Separan AP30 was used to maintain clear-water overflow in three thickeners despite 15 per cent solids in the feed water. The cost of using Separan AP30 was only $0.03 per ton of fines.

In a 20,000 ton-per-day Pennsylvania plant, 14 pounds of Separan AP30 per shift replaced 200 pounds of cornflour. 50 inches of clear water was maintained in the refuse thickener.

A West Virginia operator maintained clear-water overflow from an 85-foot thickener with 11 pounds of Separan AP30 per day. Cost was about half that of starch, used previously.

In a 23,000 ton-per-day plant, 12,000 gallons of water per minute, containing one per cent solids, was treated successfully with Separan AP30. Cost was $0.015 per ton of fines.

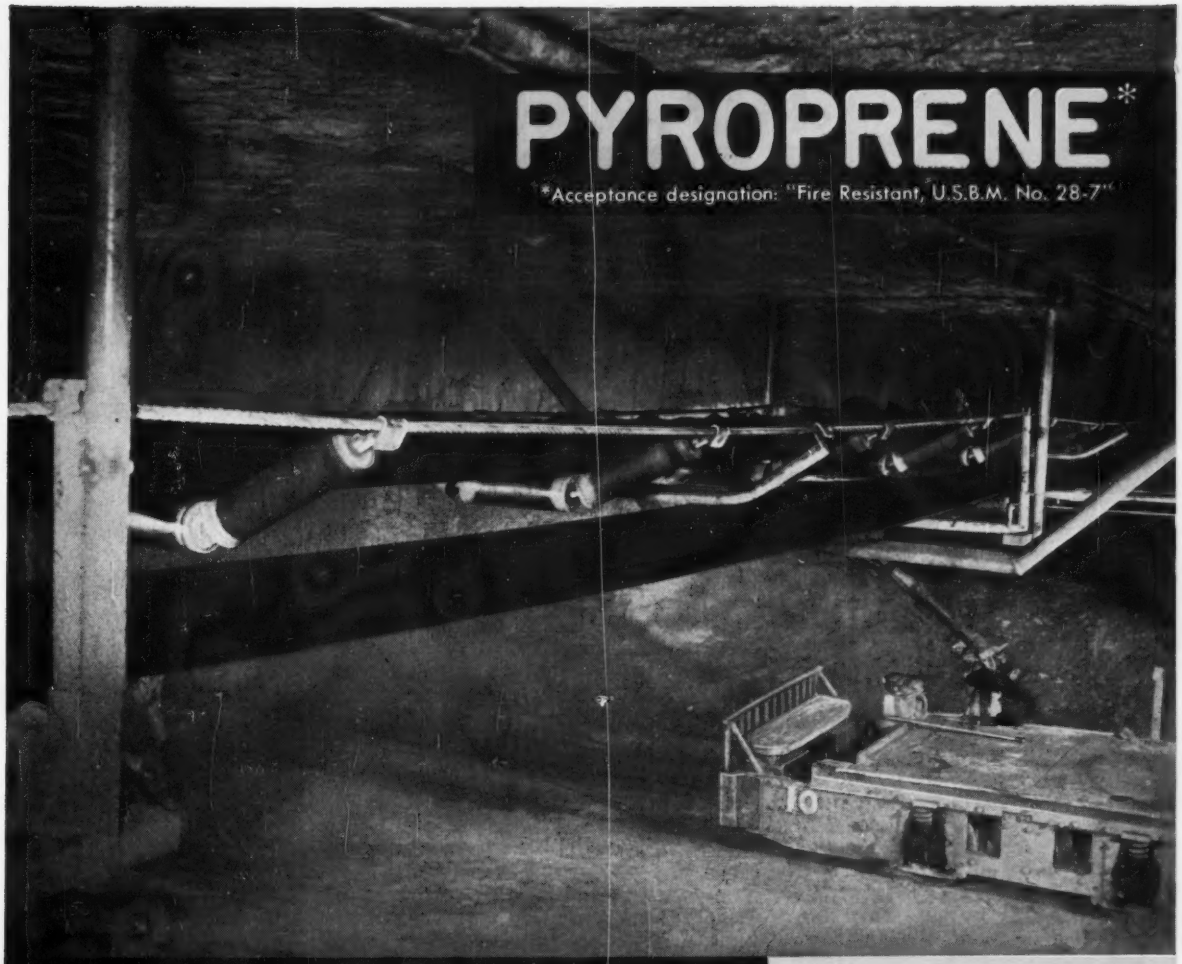
Another Pennsylvania plant of 18,000 ton-per-day capacity required only two pounds of Separan AP30 per shift to maintain the desired level of clear water. Previously 100 to 200 pounds of starch per shift had been required.

This proportioning pump and related equipment is used to make on-location tests of Separan AP30. These tests help the operator estimate just how much he can save by using Separan AP30.

If you are not using Separan AP30, arrange for a demonstration at your plant right away. There's no obligation. Just contact Dowell at 1918 Highway 41, North, Evansville 7, Indiana. The telephone number is HArrison 5-1353. Or, contact B. E. Scott at 197 Monterey Drive, St. Albans, West Virginia. His telephone number is PArkway 7-2895.

PRODUCTS FOR THE COAL INDUSTRY **DOWELL**

DIVISION OF THE DOW CHEMICAL COMPANY



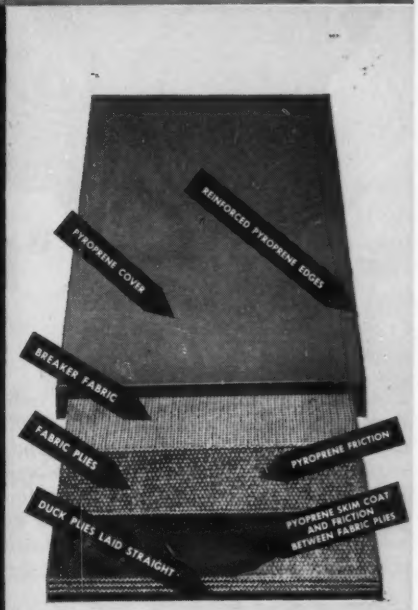
PYROPRENE*

*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-7"

Here's one overhead that runs up big profits

This Acme-Hamilton 48-in. conveyor belt, on a Goodman Ropebelt Conveyor is carrying coal at 1500 tph with low maintenance costs and long service life. Note how nicely the belt troughs under the bulky load—and how flat it runs between the return idlers . . . sure signs of excellent construction and fine quality.

PYROPRENE PROTECTED against fire, Acme-Hamilton U.S.B.M. accepted belts will not feed or spread fire. The cover is fire-resistant Pyroprene; fabric plies and breaker fabric are encased with Pyroprene compound before the belt is built. Cover has exceptional resistance to abrasion and cutting. Write Acme-Hamilton Dept. CA-91.



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NO ABRASIVE CUTTINGS GO THROUGH THIS STOPER!

S20 "DUSTLESS" STOPER is the only practical stoper for 26-inch coal. It's shorter, lighter, more powerful than all other makes — can be used wherever a man can crawl.

LE ROI S20 "DUSTLESS" STOPER

Cuttings are removed through the hollow drill steel and the chuck housing — not through the stoper! That's a big tool- and cost-saving difference between the Le Roi S20 and other makes. And that's one reason why this light, short, and powerful stoper out-drills and outlasts all other makes — why it's preferred by operators.

Its efficient dust-collection lowers dust-count well below that of wet-drilling — permits faster, easier drilling. Since cuttings are kept out of the stoper, it needs less upkeep.

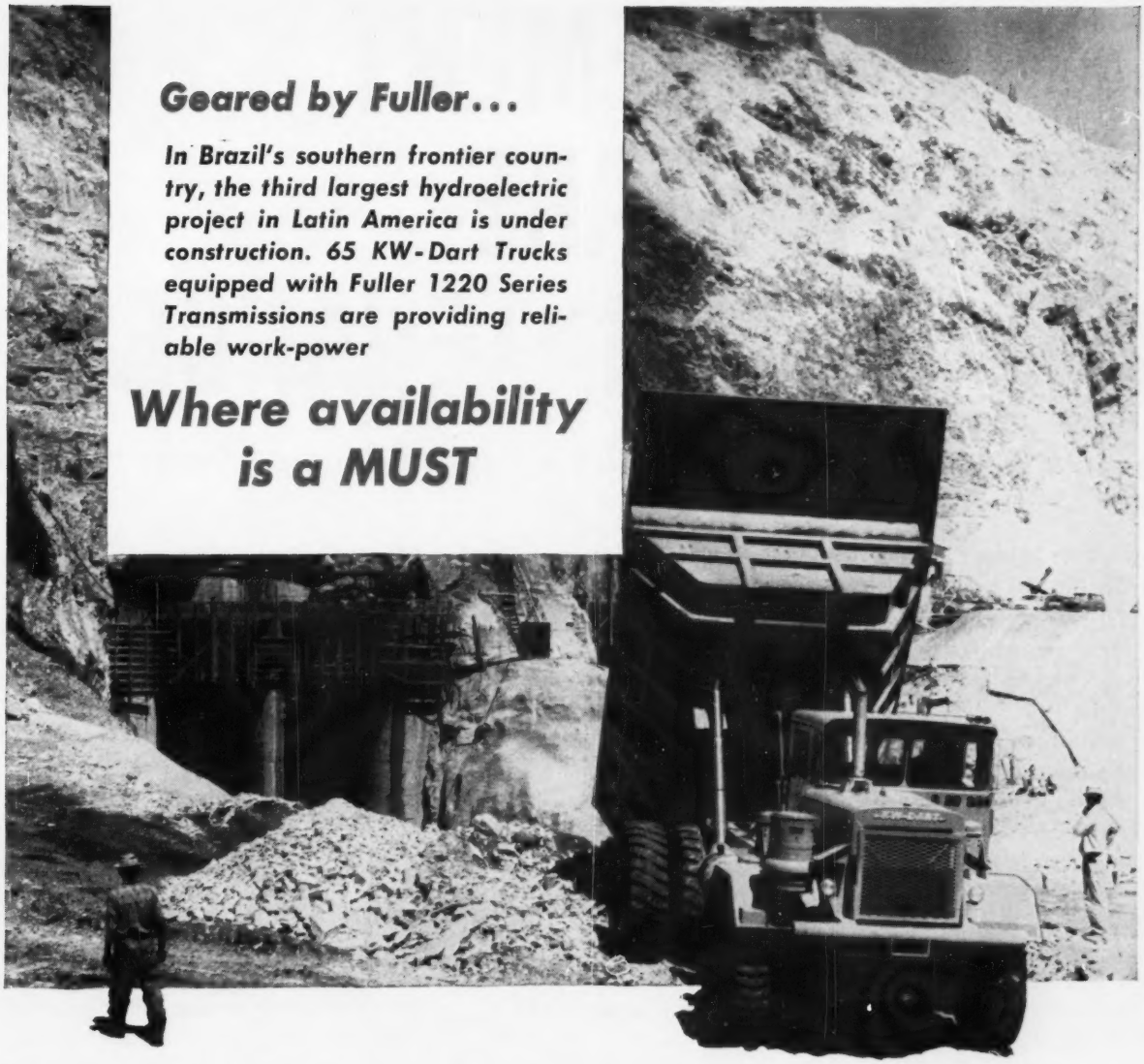
Ask your Le Roi distributor to explain how the S20 "Dustless" Stoper can help you save work and cut costs. For information, write to Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

LE ROI NEWMATIC® AIR TOOLS

PORTABLE AND TRACTAIR AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.

AT-904



Geared by Fuller...

In Brazil's southern frontier country, the third largest hydroelectric project in Latin America is under construction. 65 KW-Dart Trucks equipped with Fuller 1220 Series Transmissions are providing reliable work-power

Where availability is a MUST

To harness much of Brazil's tremendous water power potential, Central Eletrica de Furnas is building a 400-foot-high dam across the Rio Grande River. Completion date for the dam, which will create a reservoir 150 miles long, was originally set for 1965, but an earlier finish is now in sight.

Contributing greatly to the accelerated construction schedule are 65 Fuller-geared KW-Dart Trucks used on the project. 55 of the KW-Darts are Model 25SL, 25-ton dump trucks equipped with 320 hp diesel engines and Fuller 10-F-1220 10-speed Transmissions. The remaining ten are heavy-duty KW-Dart Diesel Tractors, seven of which are equipped with 10-F-1220s and the other three with Fuller 5-F-1220 5-speed Transmissions. The tractors are used to transport cement and move heavy equipment.

Working more than 6,000 miles from Kansas City, Mo., where they were built, the trucks were selected because of the dependability of their component parts. Reports from the project site indicate that the heavy-duty Fuller Transmissions in the mountain-moving fleet have been instrumental in the trucks' excellent record of performance and availability on one of the world's most dramatic construction jobs.

Ask about the Fuller Transmission designed for *your* operation.

FULLER TRANSMISSION DIVISION

EATON MANUFACTURING COMPANY

KALAMAZOO, MICHIGAN

Sales & Service: West. Dist. Branch, Oakland 6, Cal. • Southwest Dist. Office, Tulsa 3, Okla. • Automotive Products Co., Ltd., Brock House, Langham St., London W.1, England, European Rep.

MANAGEMENT HAS A STAKE IN MAINTENANCE

. . . because it can radically affect the tons-per-man rate

Nobody needs to be told—least of all management—that the coal industry is looking for new ways to boost the tons-per-man rate. That's why forward-looking operators are beginning to take a closer look at the maintenance practices in their mines.

Maintenance today is an exact science. And the rewards of treating it as such can pay off in a drop in maintenance costs—often as much as 15 per cent.

The major pay-off, however, is in raised production rates—in other words, in more tons per man-hour.

An efficient maintenance program pays immediate dividends with virtually no capital investment.

The reasons are fairly basic: In the vast majority of mines, maintenance practices have not kept pace with the rapid mechanization of mine operations. And neglect of proper maintenance will inevitably exact a toll in excessive downtime, wasted lubricants and idle men—all factors affecting the cost of producing coal.

Chief electricians and master mechanics are doing their best to combat the problem, but they need management's support—and management realization that the problem exists.

For example: A machine that's overloaded will develop more power, dig more coal. *But* it will go to the shop a lot faster, too—overloaded bearings will fail, seals will give way, and the machine is down.

Management men who have investigated this problem, have found that optimum production on a long-term basis can only be achieved by *eliminating* those practices designed to provide a short-term gain.

This means a planned maintenance program operating on a year-round basis.

TEXACO CAN HELP YOU SET UP A PLANNED MAINTENANCE PROGRAM

Lubricants are important in keeping equipment operating efficiently. Not only the choice of the lubricant itself, but also its storage, handling and application can affect equipment life. For this reason Texaco has made an exhaustive study of mine maintenance problems. We would be glad to help you set up a planned maintenance program or discuss any phase of it with you. Just call the nearest of the more than 2300 Texaco Distributing Plants or write to Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

TEXACO

Throughout the United States
Canada • Latin America • West Africa

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL
(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

United Electric Coal Co. equips new 45 cu. yd. shovel with Yellow Strand

Along the banks of the Illinois River at Banner, Illinois, a new 45 cu. yd. shovel works day and night on a stripping operation. Every 8-hour shift 17,500 tons of shale, rock and clay overburden are stripped to reach a high quality coal seam 35′ below ground.

Banner is the first coal mine, built on a river bank, with a conveyor 600′ long, to carry coal directly from preparation plant to river barge. Production at Banner Mine is 4,000 tons daily.

Because each operation must go like clockwork, United Electric Coal Co. specifies Yellow Strand Wire Rope. Among the various rope sizes, the big shovel's two main hoist wire ropes of identical lengths are 544′ of 2¼″ 6 x 41 Yellow Strand Right Lang Lay, IWRC with tapered ends and welded with becket loops. Two other shovels at Banner, plus a dragline and barge puller, are 100% Yellow Strand.

No matter what size wire rope, for large or small shovels, Yellow Strand can be depended upon to be trouble-free. Yellow Strand engineers will be glad to help you solve your shovel wire rope problems. Call them soon. *Broderick & Bascom Rope Co., 4203 Union Blvd., St. Louis 15, Mo.*

Yellow Strand®
WIRE ROPE

News Roundup

LOCATION OF NORFOLK & WESTERN RY.'S HUGE NEW COAL PIER at Lamberts Point, Norfolk, Va. is indicated at left. Cross hatching shows fill which will be made from earth dredged from pier site. N&W's present coal piers and yard are shown at center with three N&W merchandise piers and warehouses in back.

$19 Million Coal Pier Planned

CONSTRUCTION of a $19 million pier is planned by the Norfolk & Western Ry. to expand its coal shipping facilities at Lamberts Point, Norfolk, Va., according to an announcement by N&W President Stuart T. Saunders. Expected to eliminate entirely any dumping delays caused by the arrival of several vessels for cargoes at the same time, the new pier is being designed to accommodate the much larger colliers now being built such as the 35,000- and 45,000-ton Italian and Japanese colliers. Construction is to begin at once and completion is expected in about 2 yr.

Capacity

The pier will be 1,308 ft long and 83 ft wide and will have concrete pilings with a reinforced concrete deck. Conveyor fed, the new pier will be equipped with a traveling ship loader capable of dumping slack coal at a peak rate of 8,000 tph or prepared coal at 3,000 tph. There will be ample draft to berth the super colliers of the future and the facility will be able to load a 9-hatch, 45,000-ton collier with coal in 10 hr. Supporting facilities in the cost estimate include the redesigning and expansion of yards, installation of new scales and construction of a coal-scales office building and car repair facilities. Addition of the new pier will bring the N&W's Lamberts Point coal dumping capacity to some 1,800 cars a day in peak periods with an easily sustained rate of 1,600 cars.

N&W Pier History

Present N&W coal pier facilities are built on land purchased 78 yr ago. Early N&W piers were in downtown Norfolk, but in 1882, in anticipation of expanding world trade, the road bought 325 acres at Lamberts Point, including almost 2 mi of waterfront. Two years later the first coal pier was completed—985 ft long and 60 ft wide. Today there are two piers—one 1,000 ft long and the other 1,200 ft—equipped with flow controls, sprinkling equipment for allaying dust and telescopic chutes with modern trimmers. The piers have a combined dumping capacity of more than two million tons a month and are backed by supporting yards which can hold 9,650 cars.

Mergers

N&W's continuous growth program in the Norfolk area began over a century ago when the road's predecessor line first opened Norfolk to trade with the interior and has continued through the recent merger with the Virginian Ry. which greatly increased both efficiency and capacity for service. President Saunders has now announced plans for further extending the Norfolk & Western Ry. by merger with the Nickel Plate Road, purchase of the Sandusky Line of the Pennsylvania RR as the connecting link, and lease and eventual merger of the Wabash RR. The plans in principle have been agreed upon by the boards of directors of the companies involved. Under the proposal, N&W would become a system with more than 7,400 mi of road and combined assets of about $1.7 billion.

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Lignite Reserves Under Study

An intensified research program for utilizing the Nation's great reserves of lignite is under study by the U. S. Bureau of Mines. The program, said bureau Director Marling J. Ankeny, was discussed in general terms at a recent meeting of bureau scientists and administrators with members of an advisory group to the Grand Forks (N.D.) Lignite Research Laboratory, Grand Forks, N. D. During the initial meeting expected areas of growth in the lignite industry were discussed, including wider use of the fuel by electric power companies, in processing iron ore and in producing chemicals. Possible expanded uses of lignite in these areas will help guide the bureau's research efforts. The bureau reported that good progress is being made in developing equipment to gasify lignite to provide a possible substitute for natural gas as well as a beginning product for chemicals. The advisory group inspected the bureau's improved pressure gasifier which has made several highly satisfactory test runs.

Allendale Mine

of STONEFORT COAL MINING COMPANY, INC.

A new coal mine built for a dynamic industrial era ... engineered with the industry's finest facilities for efficient and economical performance.

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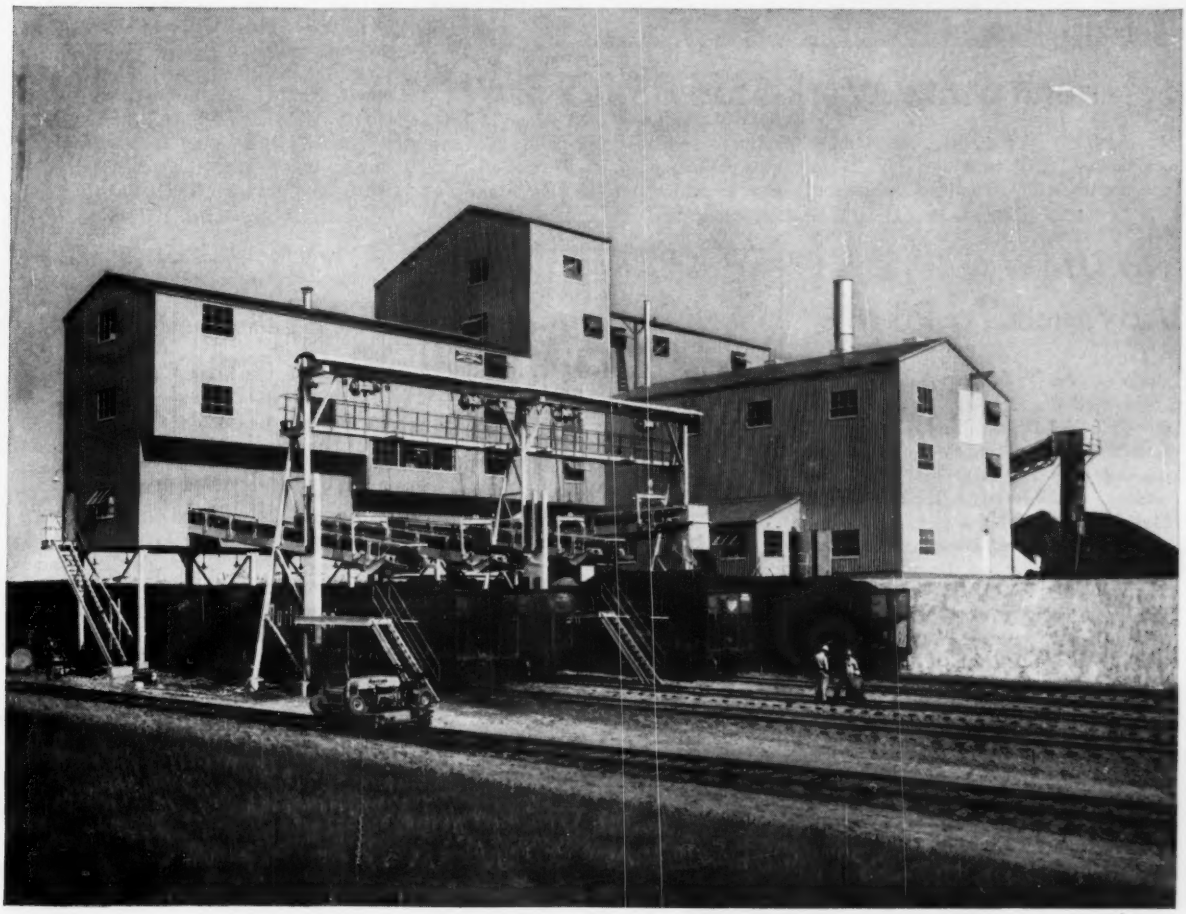

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Penn State Work-Study Students

A STUDENT-TRAINEE PROGRAM commenced at Penn State July 25 in cooperation with 17 mining companies. Pictured here are nine of the 25 freshmen participating in the 5-yr work-study plan in mining engineering. Alternating 6-mo periods of attendance at Penn State with on-the-job experience in the mining industry, the student-trainees follow a rearranged curriculum towards a BS degree in mining engineering, completing it in 5 rather than 4 yr but gaining 2 yr practical experience in the interim. Plans have already been laid to commence a second group in Sept. 1961.

Reading clockwise from lower left, the students and their sponsoring companies are: Curtis E. Myers (Harbison-Walker), Kenneth S. Barish (U. S. Steel), Gary Kapp (Jones & Laughlin), Ronald M. Gaudiano (Republic Steel), Richard K. Fleegal (General Refractories), Raymond G. Roeder (N. J. Zinc), Richard Kline (Bureau of Mines), Robert J. Houk (Ingersoll-Rand), and William Schiffbauer (Joy). Two others not shown are attending the Altoona campus, Roy E. Davidson (Pocahontas Fuel) and Roger E. McHugh (Hanna Coal).

No UMWA Advance To P&M

Through misinterpretation of the remarks of John Owens, secretary-treasurer, at the 43rd Constitutional Convention of the United Mine Workers, it was erroneously stated in the November, 1960, issue of *Coal Age*, that the union had made a credit advance to the Pittsburg & Midway Coal Mining Co. A. E. Lamm, president, has issued a statement that no financial, or other assistance, has ever been given the Pittsburg & Midway Coal Mining Co. by the United Mine Workers of America.

Pipeline Studies In Canada

Special experiments on moving coal in suspension in oil by pipeline are being carried out in Alberta, Canada.

One problem is finding an economical way to separate the pulverized coal from the oil when it arrives at its destination. Also being studied is the possibility of moving other products via pipeline. Pipeline transportation is potentially very cheap and if the experiments are successful, western products might be able to widen their share of markets in Eastern Canada. Scientists of the Research Council of Alberta are also working on the use of "torpedoes" to be carried along in any fluid moving through a pipeline. Tests with three miniature laboratory pipelines suggest that capsules, about 7 ft long, might move about 10 mph through an oil pipeline.

COAL AGE

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 COLLIERY ENGINEER, with which MINES AND MINERALS previously had been consolidated, was absorbed by COAL AGE.

In 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., Inc. COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During 49 years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Lesher, John M. Carmody, Sydney A. Hale and Ivan A. Given. The editorial staff of COAL AGE presently consists of Ivan A. Given, Harold Davis, A. E. Flowers, Daniel Jackson Jr. and D. Billmyer.

TVA Issues Bonds

Opening of bids on TVA bonds in New York in late November marked a major step in the evolution of the agency not only in physical growth but in development toward autonomy. Purpose of the sale is to give TVA funds to expand its power facilities by 800,000 to one million kw a year to keep pace with growing power demands of its service area. Present generating capacity is 11.5 million. Marking a break by TVA into new methods of financing its growth, the sale of the $50 million issue of 25-yr Series A power bonds was made to a nationwide underwriting group headed by the Chase Manhattan Bank of New York.

TVA was established and for some time supported with appropriations from the federal government which it has been repaying, with interest, throughout its 27-yr history. Private power interests which fought TVA from the start, particularly in the field of getting additional federal appropriations, were given new ammunition when the agency turned to steam plants to supplement their power production. Despite partially successful efforts of the private power interests, the 1959 law authorized TVA to borrow a total of $750 million and the agency plans to sell $100 to $150 million a year until the total authorization is used.

Revised Rock Dusting Standards

Due to increased mechanization and other advancements, new standards for rock-dusting to prevent explosions of bituminous coal and lignite dust in underground mines have been approved by the U. S. Bureau of Mines and the American Standards Association. The new standards prescribe how rock dust should be applied for maximum effectiveness and how rock-dusted areas should be sampled. For a copy of the new standards request Information Circular 8001 from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa.

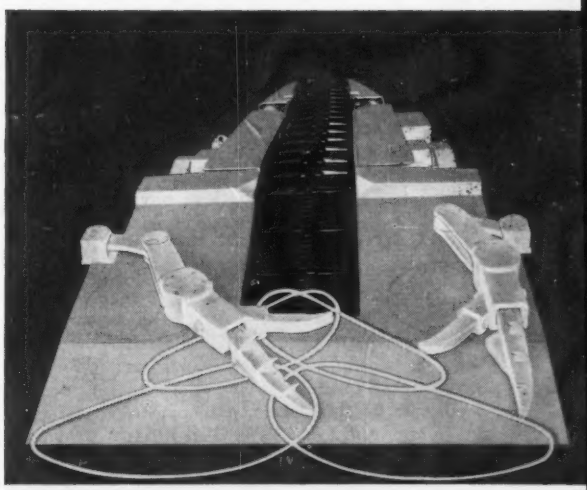
NEW DOUBLE-ARM GATHERING DESIGN MULTIPLIES LOADING EFFICIENCY

No other loading machine even approaches the new LONG-AIRDOX 188-3 in overall performance, economy, and versatility. One reason is the 188-3's exclusive reverse link, double-arm design.

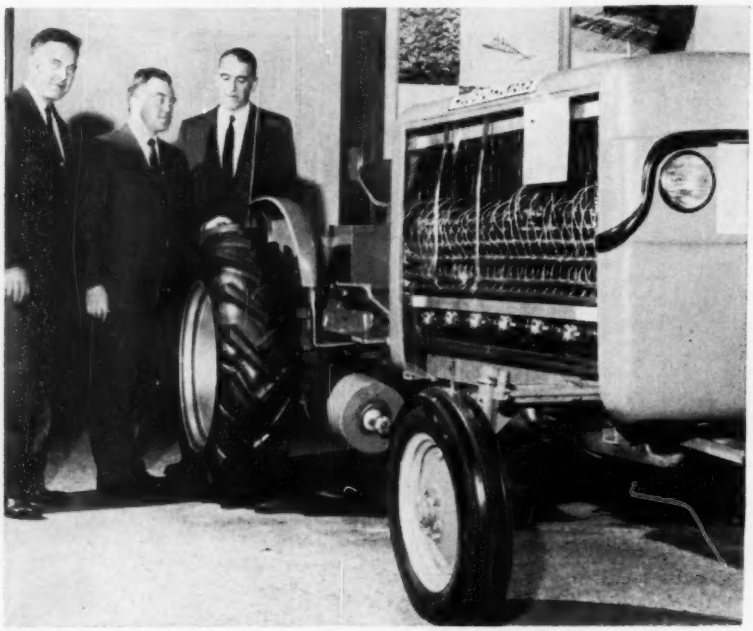
This new concept in loader construction offers these important benefits: shorter, more powerful strokes (with 30% more torque per stroke); faster, more positive gathering; less scattering of material; higher tonnages; greater efficiency.

Other advantages provided by the 188-3 include: savings on maintenance and parts inventory resulting from the simplified single motor design, better maneuverability due to independent crawler control, flatter head angle, and unusually good balance.

Available in heights 23½″ and up, with capacities to 12 tpm, 188-3 loading machines are applicable to all popular mining systems. For details or a demonstration, write Long-Airdox Company, Division of Marmon-Herrington Company, Inc., Oak Hill, W. Va.



LONG-AIRDOX



FIRST VEHICLE TO BE POWERED BY SELF-CONTAINED FUEL CELLS—a research tractor—was recently presented to the Smithsonian Institution by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Shown left to right at the presentation are Will Mitchell Jr., acting director, Allis-Chalmers Research Div.; Edward C. Kendall, an associate curator of the Museum; and Frank A. Taylor, director of Smithsonian Museum of History & Technology. Electricity to drive the vehicle comes from 1,008 fuel cells.

LC&N Coal Land Value Cut 80%

An order to reduce by approximately 80% the assessed valuation of Lehigh Coal & Navigation Co. coal lands and other property in Mauch Chunk Township and Summit Hill Borough, Pa., was made by the Lackawanna County Court to the Carbon County Board of Assessors.

The action was a result of the company's appeal from the valuation and assessments fixed upon its coal lands and other real estate. President Judge Linus Hoban, who presided at the 4-day trial, based his decision on the fact that the coal in the ground is of no value until it can be mined, prepared and moved to market. He noted, " . . . these properties have ceased to be units of economic value in the anthracite industry under the present state of the industry."

Among other companies seeking reductions in coal assessments was Glen Alden Corp. in which case a settlement has been reached resulting in an overall reduction of its coal assessments amounting to approximately 22½%. Glen Alden will make payment of a sum in excess of $1,480,000 in taxes to Luzerne County, Pa., and many of its municipalities. In 1959 Glen Alden paid about $1,720,000 in taxes. Thus, the settlement has resulted in a reduction of approximately $240,000.

Coal Items Sought

The Smithsonian Institution is seeking historical coal items for the new Hall of Coal in Washington, D. C. J. D. A. Morrow, special consultant on the project, is seeking tools and equipment, mine and machinery catalogs, photographs, engineering drawings, and published material reflecting actual conditions of coal mining since its early history.

Canadian Mine Closure Threat

A delegation headed by Premier Stanfield of Nova Scotia successfully argued the case for further consultation with the federal government before three Cape Breton coal mines are closed.

The delegation, representing the Dominion Coal Co., the United Mine Workers and the mining communities went to Ottawa to overcome the threat of closure of the three mines starting Jan. 14 which would idle about 2,500 miners. Union district president Bill Marsh said it was agreed that a further meeting representing all levels of government, the mines and miners should be held, "in the immediate future," at which time a further attempt would be made to find a way to keep the mines open and that they would not be closed before such a meeting takes place. Premier Stanfield said the only alternative is additional financial help—either through subventions on the shipment of coal to Ontario markets, through direct subsidies to the mines, or through the establishment of alternative industry.

Coal Fuels PP&L Plant

Pacific Power & Light Co.'s second 100,000-kw generating unit—its largest—at its Dave Johnston steam-electric plant near Casper, Wyo., began commercial operation in December. Fuel for the plant is subbituminous coal strip-mined by electric shovel from a field 15 mi distant. Reserves are adequate for twice present capacity of the plant for 50 yr. After crushing, coal is carried by belt conveyors either to outdoor storage or to 12 silos of 390 tons capacity each mounted on the plant. Before feeding into the furnaces, it is pulverized with Babcock & Wilcox equipment. Forced air blowers push the coal dust into the 120-ft firebox and boiler structure supplied by Babcock & Wilcox Co. General Electric Co. supplied both turbine generators.

Hard Coal Research

A progress report on anthracite's efforts to regain its economic importance through research was made at the Pennsylvania State University Nov. 15-16, 1960. Essential to success in this fight is the capture of markets using carbon industrially rather than merely as a heat source. Penn State's report on an extensive program to convert anthracite into activated carbon concluded that, considering the market price of anthracite, abundant reserves and the fairly simple process for activation, the manufacture of activated carbons from anthracite appeared to be promising. The conference consisted of 10 research reports from seven laboratories in the U. S., Canada and England. Anthracite producers found some encouragement in the fact that most of the papers were sponsored by users or potential users of hard coal.

SAVE TIME...PROVIDE MAXIMUM SAFETY

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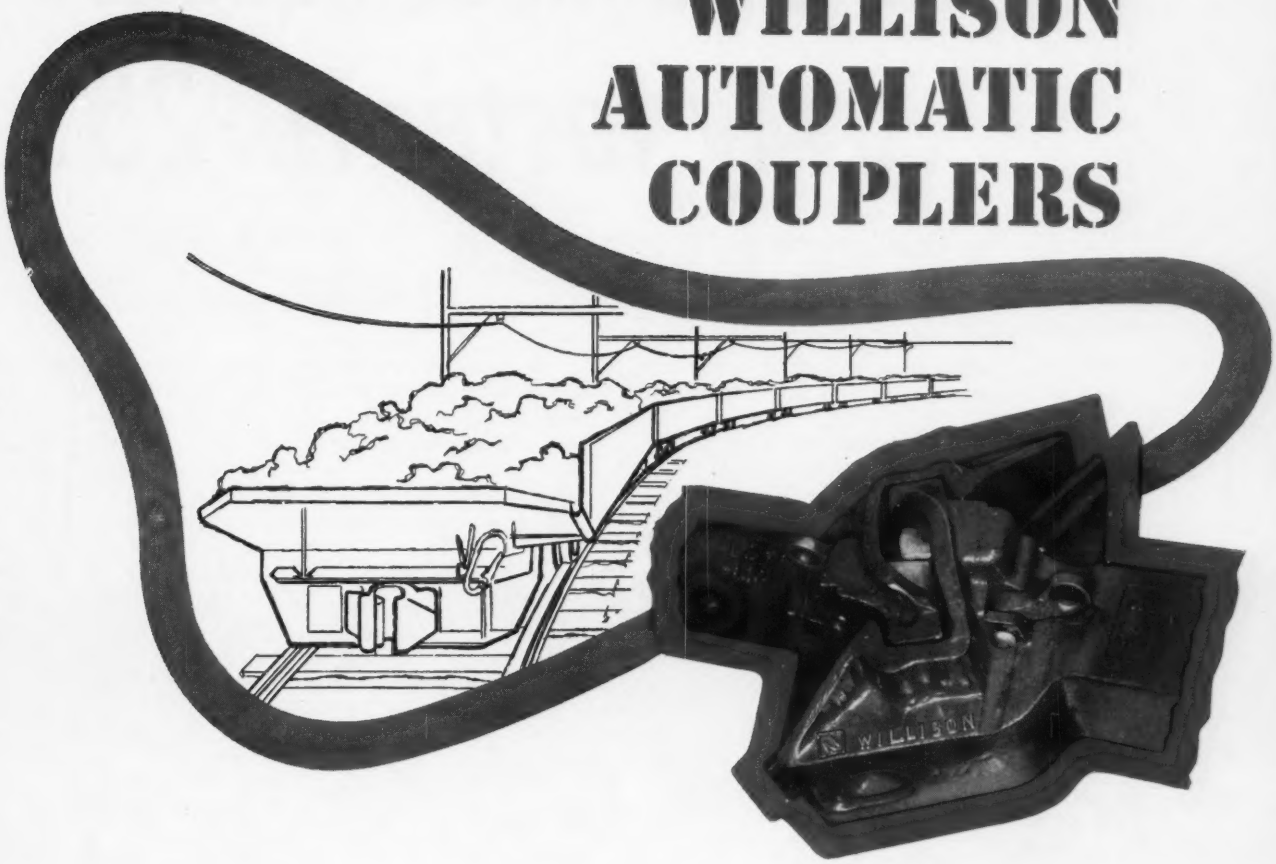

Willison Couplers automatically couple at either end of mine car or locomotive even under extreme curve conditions . . . permit higher train speeds because close coupling eliminates damaging slack . . . provide utmost safety for personnel because there's no need to go between cars to couple or uncouple. There are many technical reasons, too, why Willisons are your best buy. Let our representatives tell you all about them.

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"My TD-24 almost equalled ...My faster TD-25's

size-bigger crawlers *deliver larger loads"*

—Charles W. McClinton, Oakman, Alabama

"Actual on-the-job demonstration proved my 4-year-old International TD-24's daily production approximately equalled size-larger competitive crawlers," reports Charles W. McClinton, for McClinton Coal Company, Oakman, Alabama.

"My TD-25's are faster all-around, and deliver larger loads than the '24.' Planet Power-steering lets the operator cut big loads faster (than a clutch-steered, king-sized crawler)—and delivers the loads at a constant speed without loss of power on turns."

"Dead-track drag" eliminated

Planet powered International TD-25's keep both tracks pulling full-time—to make full-load, full-power turns, or slam straight ahead with offset loads. And combined on-the-go, Hi-Lo power-shifting gives instant, up-or-down matching of power to condition.

You make full-load turns, and keep the blade loaded. You get constant-contact benching or highwalling, applying full power, getting full speed. "Dead-track drag" and "gear-shift lag" are eliminated.

Exclusive Planet Power-steering makes the TD-25 the industry's only power-shifted 8-speed gear-drive tractor or 4-speed torque converter tractor.

Power-shift and power-steer the 230-hp TD-25 on tough overburden removal, benching, and highwalling. Prove what it means to your operating efficiency to match or outproduce size-bigger, clutch-steered crawlers. See your International Construction Equipment Distributor!

International*® *Construction Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE

Overburden 20 feet deep, half earth, half rock, is being removed here to get at a 16-inch coal seam. This McClinton-owned TD-25 cuts down highwall, and removes berms. Operator simply shifts load-side track to high range, leaves other in low range to keep "25" on course without "bank-nosing."

Planet Power-steering and on-the-go, Hi-Lo power-shifting teams with the 6-cylinder, 230-hp International DT-817 diesel—to pick up and "run" with loads like this, on the McClinton strip-mining operation. Dual valving makes this engine a "free breather," to give peak turbocharging efficiency.

People in Coal

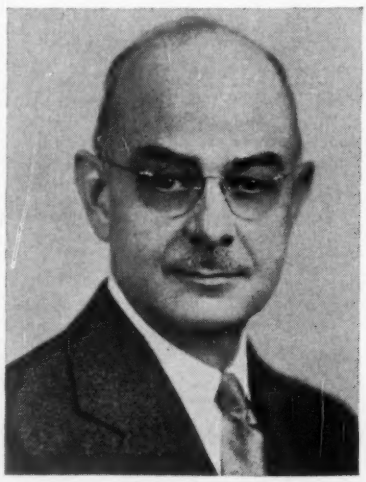
Peabody Honors Coal Pioneer

DAVID KELCE, 92 yr young and affectionately called "Dad Kelce," has recently been honored by the Peabody Coal Co. Peabody has placed in operation at its Bee Veer mine near Macon, Mo., one of the largest mobile land stripping machines which it has named "Big David" in honor of David Kelce, father of Peabody President Merl C. Kelce and Executive Vice President Ted L. Kelce. Built by Marion Power Shovel Co., the new machine, which it is expected will double production at the mine, takes 97 tons of earth overburden in one bite.

Mr. Kelce has had a long and interesting career in the coal industry which began when he went to work in Pennsylvania Coal mines at the age of nine doing odd jobs as "trapper boy." The family moved to Pittsburg, Kan., when David was 17 yr old. His first venture in coal mining in the Midwest was to develop one of the first strip mines in Oklahoma. He once drove a team of mules and a covered wagon from Pittsburg, Kan., to Seattle, Wash., where he planned to enter the contracting business but soon returned to his first love, coal mining, in the Pittsburg, Kan., area. He continues to be most active, taking frequent plane trips and making tours of the company's mines several times a month.

Dr. H. F. Yancey retired Dec. 1 as chief of the Seattle Coal Research Laboratory of the U. S. Bureau of Mines after 43 yr in government service. He was succeeded by **Max R. Geer,** his assistant. Dr. Yancey had headed the Seattle laboratory since 1925. Author of more than 100 scientific reports he has developed equipment and test methods used throughout the mining industry. During the closing years of World War II, he lead a group of engineers and scientists into Germany to evaluate European wartime developments in coal technology. After the war, he was assigned to General Douglas MacArthur's staff in Japan to improve coal-mining methods there. Dr. Yancey won the Percy Nicholls Awards from the AIME and the Distinguished Service Award of the Dept. of the Interior.

Eastern Gas & Fuel Associates has announced the following changes in assignment of superintendents in southern West Virginia mines: **Donald B. Shupe,** formerly superintendent of Wharton No. 2 mine, Wharton, W. Va., has been transferred to superintendent of the company's Kopperston Mine at Kopperston, W. Va. **Robert H. Freeman,** former superintendent of Wharton No. 1 mine, has been transferred to superintendent of Wharton No. 2. **Wayne M. Plymale Jr.,** superintendent of Eastern's Beards Fork Mine, Beards Fork, W. Va., which closed recently, has become superintendent of Wharton No. 1.



Carl E. Lesher has recently received the Percy Nicholls Award of the AIME-ASME, given for "notable scientific or industrial achievements in the field of solid fuels." A graduate of the Colorado School of Mines, Mr. Lesher was awarded the school's medal in 1949 for achievements in the field of mineral engineering. He had been associated with the U. S. Geological Survey and National Coal Association, and had also been editor of *Coal Age* for 4 yr. He became assistant to the president of the Pittsburgh Coal Co. in 1924 and executive vice president 3 yr later. In 1939 he was appointed president of the Pittsburgh Coal Carbonization Co., a subsidiary which became Disco Co. under the Pittsburgh Consolidation Coal Co. after the merger in 1945. Mr. Lesher was responsible for the control of mechanical coal cleaning by the Pittsburgh Coal Co. in 1929 and developed the Disco process of low temperature carbonization.

Clyde E. Davis, inspector-at-large in the Kanawha Dist., will take on additional duties as acting deputy director of the W. Va. Dept. of Mines. He will carry out work done by **Paul C. Lingo** who resigned to become assistant safety director for the Bituminous Coal Operators Association.

Newton H. Debardeleben, president of Debardeleben Coal Corp., Birmingham, Ala., has been reelected vice president of the Alabama State Chamber of Commerce.

G. B. Fillmore has retired as president of the Hudson Coal Co., now named the Wyoming Valley Improvement Co. He will continue, however, as a director of the firm. Mr. Fillmore became associated with Hudson in 1919

(Continued on p 40)

FOR COMPANIES OF EVERY SIZE

CMI COAL DRYERS

The Two Most Popular Sizes of CMI Continuous Centrifugal Coal Dryers

MODEL 36 (above)—65 TPH
COMPACT 26 (left)—20 TPH

Hundreds of installations prove that best results in centrifugal coal drying are obtained with CMI Dryers. CMI performance claims are conservative and correct.

GENERAL SPECIFICATIONS	COMPACT 26	MODEL 36
Conservative rating with feed of ¼ x 0 product at 35% surface moisture	20 tph	65 tph
Percent recovery of product	over 90%	over 90%
Percent surface moisture of discharge product	under 6%	under 6%
Horsepower consumption	10-15 hp	50 hp
Total machine weight, including motor	4700 lbs.	13,000 lbs.
Floor space required	59″ x 59″	71″ x 76″
Overall machine height	52″	80″
Motor specifications	15 hp; 1800 rpm	50 hp; 1800 rpm

For complete information, write for literature.

CMI

CENTRIFUGAL & MECHANICAL INDUSTRIES, INC.

146 PRESIDENT STREET • ST. LOUIS 18, MISSOURI

Coal Abroad

Pithead Stocks Drop at ECSC Mines

Helen Avati, McGraw-Hill World News, Paris

Reaching their lowest level since April, 1959, pithead stocks at European Coal & Steel Community mines dropped to 29,515,000 metric tons at the end of October, 1960. Overall reduction in the six ECSC member countries amounted to 880,000 tons in October, or 2.89% below September, as reported in the ECSC monthly bulletin.

Biggest drop during the month was in Germany where stocks slid down 10.1% to hit the lowest level in 2 yr. In France on the other hand, pithead stocks continued to pile up at the rate of 2 to 3% a month and reached 13,276,000 tons at the end of October. On Oct. 31, German stocks amounted to 8,600,000 tons, Belgian stocks to 6,784,000 tons, Italian stocks to 128,000 tons and Dutch stocks to 727,000.

Coke stocks in the six countries dropped to 6,885,000 million metric tons in October from 7,060,000 in September. Breakdown of stocks at month's end showed that German cokeries held 5,537,000; Belgian, 249,000; French, 678,000; Italian, 175,000; and Dutch, 246,000 tons.

Unemployment in ECSC mines was lower in October than it has been at any time since the beginning of the European coal crisis in 1958. Loss of production due to unemployment in the six countries totaled 182,000 tons during the month, compared to 274,000 in September and 867,000 in October 1959.

Apparatus Determines Ash Content of Coal

In conjunction with an apparatus factory, named Netherlands X-Ray apparatus factory Evershed-Enraf, of Delft, the Netherlands State Mines designed an apparatus for the rapid, continuous determination of the ash content of coal. The apparatus consists of a sampling unit which takes a representative sample from the run of coal, a conditioning unit in which the sample is dried and ground, and the actual analysis unit. Operation of the analysis unit is based on the difference in the reflection of X-rays between combustible and noncombustible coal constituents. Samples chosen from the run of coal and conditioned are fed continuously to a rotary disc exposed to an X-ray beam. The difference in reflection between the various constituents of the sample and a reference sample is measured photoelectrically and recorded on a strip, and also transmitted to a meter calibrated in percent ash. The signal can also be used for automatic control of the coal washing plant, thereby ensuring a more constant product as regards ash content.

Newest development in rail welding is the Thermit Self-Preheat process—simplest of all welding methods.

There's no costly equipment to buy and haul in and out of the mine. Materials required come in kits. Each kit contains everything needed to make one weld.

And, because preformed molds are used and preheating of rail ends is unnecessary, you can actually make a rail weld in less than fifteen minutes

Write for detailed information.

THERMIT Rail WELDING

Thermex Metallurgical, Inc., Lakehurst, New Jersey

OVERSEAS FLASHES

JAPAN—Total coal consumption for the first 6 mo of fiscal 1960 amounted to 25,494,000 tons—an increase of 3,973,000 tons over the same period for 1959. Of this total 3,698,000 tons were imported, showing an increase of 1,192,000 tons over the 1959 period. Domestic output during the 1960 period totaled 24,950,000 tons as against 23,470,000 tons dug out during the same period of 1959. Japan's steel industry has been compelled to use a considerable quantity of imported coal ever since prewar days due to its need of high-quality coking coal which cannot be produced abundantly in Japan.

GREAT BRITAIN—A production target of 200 million tons a year has been set up by Britain's nationalized coal industry. National Coal Board Chairman Alfred Robens believes that electrical generation by early 1970s will take half this output, and he noted that though the fuel demand of general industry is being strongly threatened by oil, the coal board is determined to meet this threat.

In this connection, Britain's Trades Union Congress is considering approaching Prime Minister Harold Macmillan in the near future to present demands for a national fuel policy to include a request for government measures to check the growth in British oil consumption. The TUC move follows publication of correspondence between the National Union of Mineworkers and Minister of Power Richard Wood in which Wood rejected

the plea for restrictions on use of oil. According to the Minister, British annual energy needs in the late 1960s would be about 300 million tons (coal equivalent) and coal mining capacity needed in 1965 would be not significantly less than 200 million tons.

On the lighter side of happenings in Britain was a rumpus stirred by the flag James Banks flies in his coal delivery yard in Dartford. The local council claims the flag which bears the inscription: "J. Banks and Sons," is an advertisement for Bank's business and that he should have sought permission before flying it. Banks rejected this and said the flag was his family's emblem. "Dukes and earls fly their flags and I fly mine," he said. The council is threatening to send its workmen to haul down the flag and bill Banks for the job.

FRANCE—A Ministerial meeting of the European Parliamentary Assembly has reached a far-reaching plan for using the executive groups of the 6-nation Coal and Steel Pool, the Common Market and Euratom, the atomic pool. Plans drawn up would substitute a 15-member super-executive for the present independent directorates. The organizations would name 14 members and those 14 would elect the 15th. The executive board thus chosen would be confirmed in office by the European Assembly which would maintain the same veto power over its actions which it now exerts separately over the three communities. The new super-executive, however, would not mean the fusion of the three communities into one organization but the executive would be responsible for overall planning and coordination. If approved by the assembly, the plan would then go to the separate governments for final adoption.

Bituminous Output

YEAR TO DATE	PRODUCTION
Dec. 10, 1960	387,850,000
Dec. 12, 1959	388,635,000
1960 output 0.2% behind 1959	
WEEK ENDING	PRODUCTION
Dec. 10, 1960	7,555,000
Dec. 12, 1959	9,335,000

Anthracite Output

YEAR TO DATE	PRODUCTION
Dec. 10, 1960	16,890,000
Dec. 12, 1959	19,502,000
1960 output 13.4% behind 1959.	
WEEK ENDING	PRODUCTION
Dec. 10, 1960	402,000
Dec. 12, 1959	446,000

■ Tough jobs call for tough screens . . . screens that have been carefully, intelligently engineered. By making tough jobs look easy, Bee-Zee Screens make you money. They're all-stainless-steel and *all-welded*, with rods spaced precisely by electronic control. The equipment you own and operate right now can be equipped with Bee-Zee Screens—as shown above or in any of the rod shapes shown below. Wire, write or phone Galesburg DIckens 2-5154 collect.

BIXBY-ZIMMER
ENGINEERING CO.
111 Abingdon St., Galesburg, Ill.

Bee-Zee Screens in a wide variety of shapes and sizes meet the needs of leading firms in the coal, minerals, quarry, oil, food, chemical, plastic, brewing, distilling, pulp and paper, rubber and other industries.

1960 has been a year of significant technical gain and measurable improvement in overall incoming business volume. In technology, a selective concentration of our development effort has begun to show results. Some of these new units and processes currently being marketed are mentioned below. Others, several of which show considerable commercial as well as technical promise, are nearing fruition and should be available during 1961. Progress in basic product standardization and redesign has also played a significant part in our technical advance and will have a substantial effect on our ability to serve our customers.

Virtually every segment of our worldwide operations has contributed to the increased volume of new business with an unusual degree of activity on exceptionally large projects apparent in many areas of the world. This overall gain has been reflected in somewhat higher billings and profits but a substantial increase in backlog has been the primary result.

METALLURGICAL—During the past year, the first installation of the new Dorr-Oliver DSM Heavy Media System went into operation on iron ore beneficiation in Minnesota. This process utilizes a DorrClone unit as the heavy media separatory vessel and other newly developed D-O units in the media cleaning circuit. As compared with conventional practice the new system provides better media cleaning, improved recovery and grade of ore and sharply reduces magnetite losses.

Included in the flowsheet is the D-O SiphonSizer, a hydraulic classifier operating on the hindered settling principle. In limited use for several years, this unit is now being applied in the metallurgical and non-metallics fields on both a commercial and experimental basis where sharper classification is of benefit.

For water conservation, one of the largest center pier Dorr Thickeners to be built in recent years is soon to go into operation for a major copper producer. Overall diameter of this unit is 375 feet.

NON-METALLICS—The continued installation of varied D-O equipment in wet process cement plants throughout the world has reflected the expansion of this industry, particularly in South America. It is interesting to note that in this latter area several Dorr Slurry Mixers in the 100 foot dia. range are being installed. These are among the largest ever fabricated.

A new development of significance in the cement industry was the introduction of the 270° DSM Screen —a unit which has increased grinding mill capacity when used for closed-circuiting or scalping. Considerable operating experience is available from several installations in Australia and Europe.

Substantial flowsheet improvement in phosphate rock beneficiation and coal washing has resulted from the application of sharper classification in Dorrco Hydroscillators and Sizers. The Oliver Horizontal Filter and the Dorrco FluoSolids System have been successfully operated in combination.

FOOD & PHARMACEUTICAL—In food and pharmaceutical industries, highly efficient separations coupled with economies in operating costs and space continue to attract processors to Dorr-Oliver centrifugal equipment. In the starch industry, for example, Merco Centrifuges, Mercone Screening Centrifuges and DorrClone Systems were selected in various combinations for expansions, modernizations and new plant facilities in Argentina, Mexico, the Philippines, South Africa, Uruguay and the United States.

Food processors also discovered the advantages of the DSM Screen and began to apply them to various dewatering jobs, such as germ separation, fibre washing and pulp removal from waste process waters. A new rotary vacuum filter of plastic construction, with interesting cost savings over stainless steel, performed well on clarification of fruit juices. Small diameter DorrClones in porcelain construction also solved speck and seed removal problems in various juice lines.

A leading manufacturer of new, high protein products for food and industrial use has utilized D-O equipment and services in developing new, continuous processes.

CHEMICAL—The versatile Oliver Horizontal Filter was applied to the washing and dewatering of a number of granular chemical products. A major breakthrough in the thermal drying of nitrocellulose by a special design of the Oliver Horizontal Filter resulted in substantial reduction in operating costs with a significant advance in safety. A multiple and repeat installation

of Horizontal Filters for phosphoric acid production was ordered late in 1960 from a major producer.

The newer unit operation of centrifugation continued to prove its potential in the field. Typical examples of its application are the successful use of Mercone and DorrClone units for carbon removal from paraffin oil and of a Merco Centrifuge for the removal of impurities from phosphorus.

PETROLEUM & PETROCHEMICALS—A new development of importance during 1960 was the application of the Mercone Centrifuge to the removal of liquids from polymer crumbs. One of the most exciting developments was the success of a special 'clamshell' DorrClone for catalyst removal from cat-cracker-fractionator bottoms. This solves a long standing refinery problem and should have wide application.

The Synrub filter is still an accepted standard in the processing of synthetic rubber both in the United States and elsewhere in the world. As an example, South America's first synthetic rubber plant, which was built during the year in Brazil employed a multiple D-O Synrub filter installation.

In the field of petroleum production, a principal D-O activity continued to be the use of DorrClone desanding and degritting units in water injection and drill mud conditioning. These are also now being applied to degritting of crudes.

The high demand for paraxylene has been partially solved by the application of a Merco Centrifuge separating paraxylene from a xylene stream at —80° F. Higher recoveries are achieved than ever before.

PULP & PAPER—The continuing increase in paper demand in every part of the world has resulted in the sale of brownstock washing, recausticizing and pulp bleaching systems both in the United States and abroad. Filters, pumps and sedimentation equipment have also been in demand for both pulp processing and such accessory services as water and waste treatment.

A significant advance in pulp bleaching by chlorine dioxide, the D-O concentric bleaching tower was made available broadly to the industry this year. The first of these towers has completed a year of highly successful operation in Idaho; the second will be in operation early this year.

Close cooperation and attention resulted in the supply of substantially all equipment for additional brownstock washing and bleaching sections at the newest mill in the Northwest.

MUNICIPAL AND INDUSTRIAL WASTE TREATMENT—Interest was extremely high in activated sludge treatment and applicable new D-O developments continued to gain momentum. The D-O Aerator was applied to the treatment of combined strong domestic and industrial wastes in municipal plants. Late in the year, the D-O Inka Aerator was introduced. Developed in Sweden and widely used in Europe, it combines high oxygen absorption rates with low power requirements and can be used most effectively on low BOD waste.

Programs conducted in the field on Densludge thickening and digestion were reported in detail during the year. One major city expects to save $6,000,000 in its current plant construction program through the use of this technique. In another interesting application, the Sultzer Disintegrator has improved digester performance in one large municipal plant when used to grind the thickened sludge.

Successful demonstrations of the RSR Clarifier proved the efficiency of this new unit for separating high volatile return sludge from waste sludge. Also, the use of the SpiroVortex System for the activated sludge process was further exemplified by a new installation in California.

In the area of sewage sludge dewatering, Dorr-Oliver Plastic Filters proved successful at Westport, Conn., and Paw Paw, Mich., while new filters of conventional design were installed at Harrisburg, Penna., and Marshall, Miss.

WATER TREATMENT—An outstanding event of the year in water treatment was the completion of the five-year construction program at Philadelphia's ultra-modern 423 mgd Torresdale plant for which D-O supplied four Dorrco Flocculators, and four Dorr Squarex Clarifiers. Another outstanding municipal water treatment plant is under construction by the Metropolitan Water District of Southern California. This plant will incorporate sixteen Dorr Squarex Clarifiers.

In the area of recent developments, a new Dorrco PeriFilter System will shortly go into operation at a southern city to treat 4.0 million gallons a day, and successful pilot plant demonstrations of an improved lime sludge handling method were carried out in several mid western cities. An increasing number of DorrClone units for desanding well water are being installed to protect meters and valves in industrial and municipal water supply systems.

Worldwide activity in new industrial plant construction, particularly in the pulp and paper field, has resulted in much activity in the application of both Hydro-Treators and conventional pre-treatment units to industrial water treatment.

PROJECT ENGINEERING — Much of the activity in this sector of D-O operations was provided by the rapidly expanding fertilizer industry. This included plants for the beneficiation of phosphate rock and for the production of phosphoric acid, ammonium phosphate, triple superphosphate and complete granular fertilizers. Typical of this area of activity are two phosphoric acid plants now being designed by D-O in Florida on a turnkey basis. A plant of unusual interest is being designed to recover ilmenite from heavy, mineral bearing sands for the ultimate production of titanium. D-O engineering includes the processing equipment, all auxiliary facilities and structures.

Other engineering projects include beneficiation of iron and copper ores, recovery of copper scrap, and facilities in such diverse fields as the pulp and paper industry, nitrocellulose manufacture, and starch production. Geographically, projects are underway in Africa, Brazil, England, France, Germany, India, Ireland, Japan, Jordan, Mexico and Yugoslavia as well as the United States.

FLUOSOLIDS SYSTEMS—1960 was a year of unusual activity involving both new and thoroughly demonstrated applications of fluid techniques. Plants for drying fine coal and both the drying and calcination of varied metallic and non-metallic ores continue to be in demand and contributed substantially to overall volume.

In the realm of the new and unusual—an important plastics plant went into production during the year utilizing a Dorrco FluoSolids System to dry the product Other similar applications are in the development stage. Another unusual application involving the roasting of copper concentrates for partial removal of sulphur prior to smelting will go into operation early in 1961. Also in 1960 a major chemical manufacturer ordered a third FluoSolids Reactor for processing food additives.

Of particular interest is a 200 ton per day lime plant scheduled for completion in mid 1961 in Florida. It is being completely designed and engineered by D-O on a turnkey basis with FluoSolids Reactors utilized in both the key steps of limestone drying and calcination.

SUGAR—Two new D-O developments were introduced to the Cane Sugar industry during 1960.

The D-O Rapi-Floc System introduces a controlled flocculation step before filtering of cane mud on a modified Oliver-Campbell Filter. The second development involved the application of DSM Screens to juice screening, with improved clarification and filtration reported as a result.

Throughout the year there has been a continuing demand for RapiDorr Clarifiers, Oliver-Campbell Filters and other standard Dorr-Oliver equipment for both new and expanded cane sugar mills, with the Middle East, Far East, Africa and Latin America particularly active.

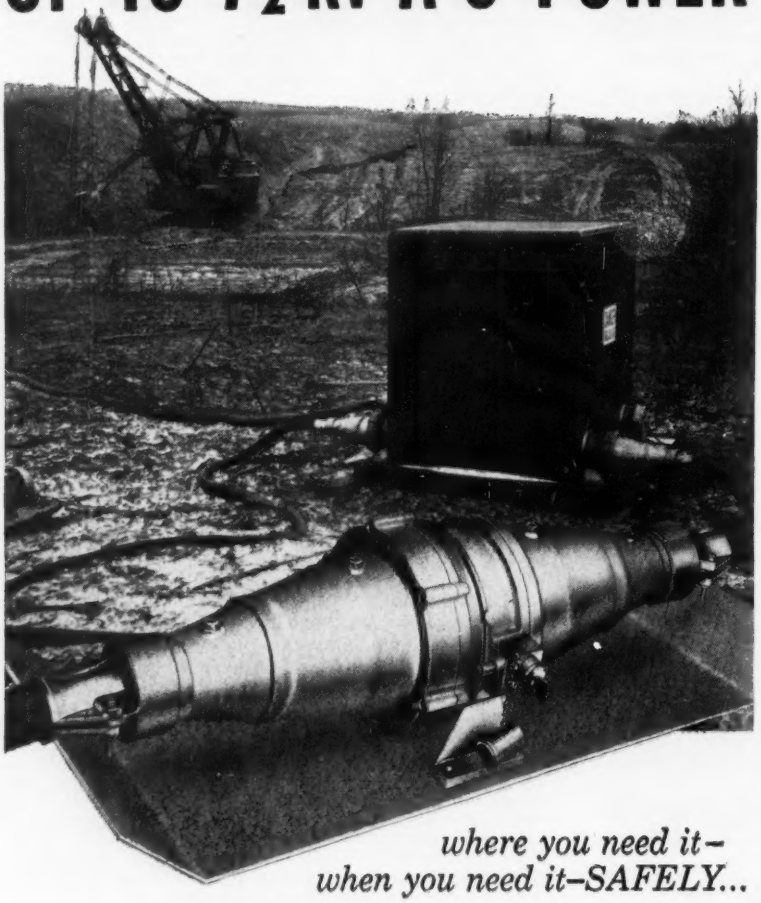
We have several challenges ahead. We must provide our customers with even greater technical competence and service. We must continue to improve our profit structure to provide the income we need for continued technical and corporate growth in the future. We must provide growth and stability by adding to our product lines and areas of activity.

Through the dedicated efforts of our staff around the world we have made substantial progress in these areas during the past year. I am confident that this progress will continue and accelerate in the months ahead.

L. R. Boling
President

December 1, 1960

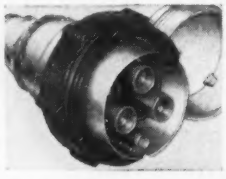
UP TO 7½ kv A-C POWER



where you need it—
when you need it—SAFELY...

with handy PLM cable couplers

High-voltage a-c power goes to work easily and conveniently to meet today's needs for higher horsepower, when you use PLM plug-and-socket Cable Couplers. Portable power cables can be connected or extended, simply and safely, to bring substation power where you need it, when you need it. Strong but lightweight, watertight cast aluminum housings are built for roughest open-pit or deep mining service conditions. Pressure-molded insulators and electrical and/or mechanical interlocks insure continuity of service, and protect personnel and equipment. Can be applied directly in the field.



SAFE—No exposed connections. Ground circuit is first to close, last to open. No contacts are made until after threaded housings engage.

Supplied for flange, foot or sled mounting, as plug and socket, or as 2, 3 or 4-way junction box assemblies. Write for bulletin. PLM Products, Inc., 3881 W. 150th St., Cleveland 11, Ohio.

7½ kv
300-ampere
PLM
CABLE
COUPLERS

News Roundup *(Continued)*

as a special engineer and successively became chief inspector, assistant general sales agent in 1922 and general sales agent in 1929. In 1937 he was elected vice president and in 1946 became senior vice president. He succeeded to the presidency in 1950.

Merl C. Kelce, president, and **F. Stillman Elfred,** board chairman, Peabody Coal Co., St. Louis, Mo., were guests of Bucyrus-Erie Co. Dec. 13. During their tour of South Milwaukee (Wis.) shop facilities, Messrs. Kelce and Elfred got a look at a massive 3,700-lb crawler link—the first of 296 cast links to be used in construction of four sets of dual crawlers for a giant 115-yd stripping shovel.

Two leading coal executives elected to the board of directors of the National Coal Association were **Arnold E. Lamm,** president, Pittsburg & Midway Coal Mining Co., and **C. B. Lakin,** executive vice president, Berwind-White Coal Mining Co. Mr. Lamm succeeds **E. R. Phelps** who resigned and Mr. Lakin fills the vacancy created by retirement of **William H. Ritter.**

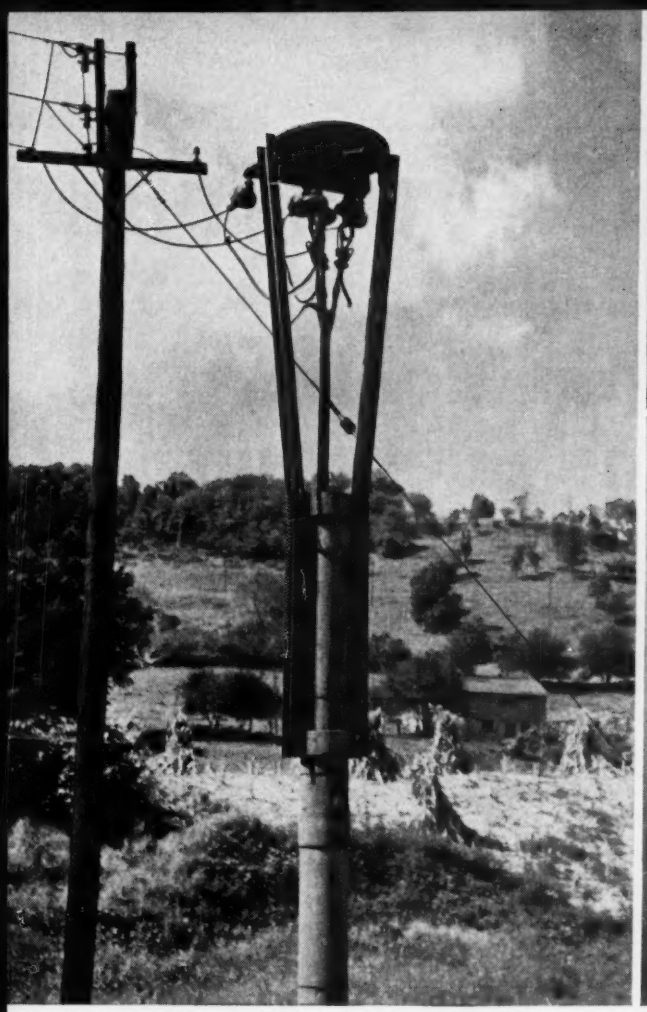
Alan H. McBane, formerly general manager, has been elected vice president of the Valley Camp Coal Co., Cleveland, Ohio. He has been associated with the company since 1934.

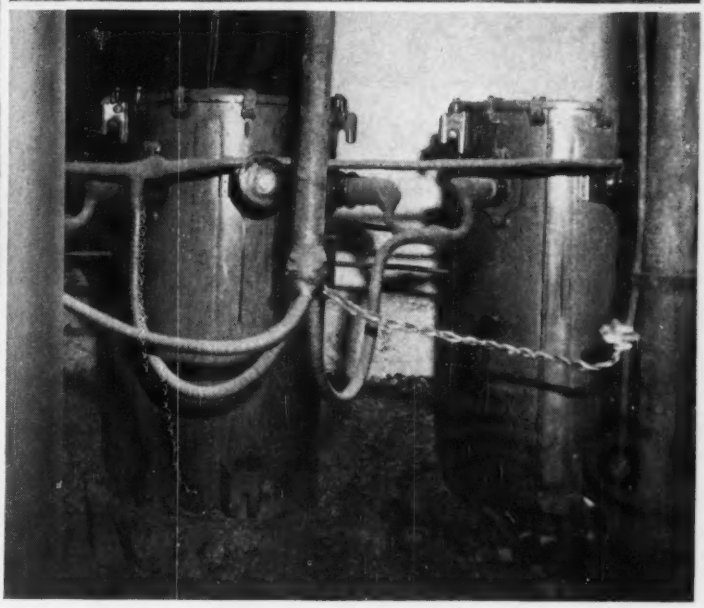
Association Activities

Raymond E. Salvati

The **American Mining Congress** has reelected as president, **Raymond E. Salvati,** president, Island Creek Coal Co. Among the eight directors elected for 3-yr terms were **George H. Love,** chairman of the board, Consolidation Coal Co.; **Robert P. Tibolt,** president, Eastern Gas & Fuels Associates; and **George J. Clark,** president, Reading Anthracite Co.

(Continued on p 46)





Less outlay for input

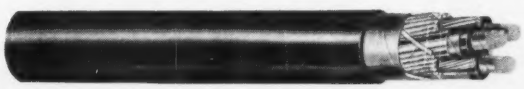
HOW TO SAVE UP TO 28% ON YOUR POWER FEEDER CABLE

Yours may be one of the many mines which can reduce power feeder costs with Rome's MPT.

This is a power feed cable designed for systems with relatively steady loads.

It can save you as much as 28¢ on the dollar, just in the price of the cable alone.

MORE SAVINGS



But price is only the first of many ways you save with Rome's MPT.

Installation costs you less, because MPT goes in faster. It is smaller and lighter, handles easier, and uses smaller fittings than other power cables.

Rome's MPT cable gives reliable service under the severe conditions incident to mine power service. Here you have one of Rome's best thermoplastic combinations: tough Rolene insulation plus special flame-resistant Roseal jacketing. This gives you exceptional resistance to chemicals, moisture, abrasion, and other hazards commonly found in mines.

Safety features include ground-fault protection, a low-resistance circuit in case of shielding failure or ground faulting of equipment, and of course the flame-resistant jacket.

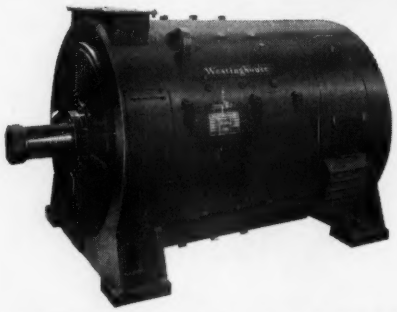
You can use Rome's MPT in boreholes, shafts, trays, aerially or underground. For specific details on the money you can save with this cable, call your nearest Rome Cable representative.

Or write us for a copy of Bulletin RCP-751, "High Voltage Mine Power Feeder Cables." Rome Cable division of Alcoa, Dept. 15-11, Rome, New York.

ROME CABLE
DIVISION OF **ALCOA**

24 Westinghouse Main Drive Motors and Control to Power Largest Mobile Land Machine Ever Built

14,500 Horsepower to Drive Bucyrus-Erie's New 14,000,000-Pound Giant Shovel for Peabody Coal Co.



Main drive d-c motors and M-G sets have exclusive Westinghouse Thermalastic® insulation, exceedingly stable and resilient, to withstand electrical thermal shock variations encountered in shovel service. Tough, low-inertia d-c motor armatures make possible very fast starts, stops and reversals.

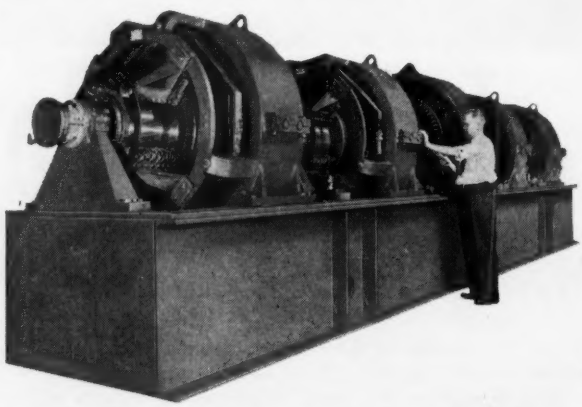
Westinghouse electrical equipment —powerful, fast and reliable—will drive this huge shovel. For digging there will be eight 625-hp d-c hoist motors, six 500-hp d-c swing motors, and two 500-hp d-c crowd motors. A separate d-c generator will power each motor. The generators will be assembled into four M-G sets, each driven by a 3000-hp synchronous motor. Eight 250-hp a-c motors will power the crawler propel drives. Dozens of smaller motors will power various auxiliary drives.

Modern Magamp-exciter control provides smooth performance and fast response of the main d-c drives with minimum current overshoot. Flexible and easily adjustable, this control permits selection of optimum motor performance characteristics needed for any particular digging condition.

With Westinghouse Magamp-exciter control for the hoist, swing and crowd, the huge machine will have a 50-second digging cycle. Loaded dipper speeds during swing will reach 25 miles an hour; the boom will accelerate to top speed in eight seconds and decelerate to zero speed in four seconds. Westinghouse drives will be built to maintain this demanding performance continuously, withstand extreme vibration and still develop over 200% of rated loading whenever required.

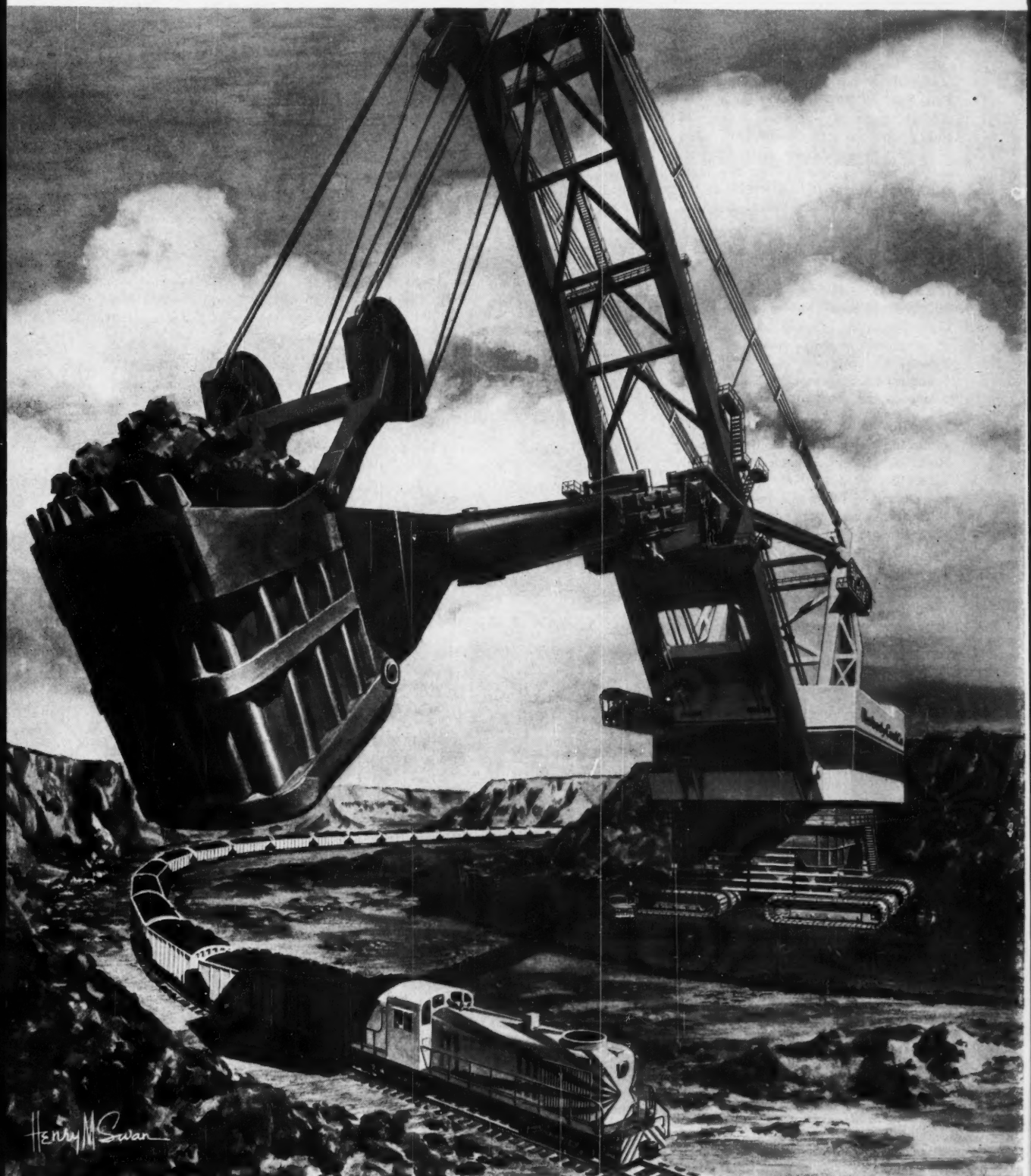
You can be sure...if it's Westinghouse

J-96159



World's largest shovel motor-generator sets have these design features—Heavy-duty, self-aligning, spherical seat pedestal sleeve-type main bearings and double-ball end thrust bearings —permitting operation at as much as 10° tilt. Extremely heavy and rigid self-supporting bedplate—insuring that rotating units will stay in correct alignment even under heavy shock stresses and vibration transmitted from shovel structure.

Westinghouse



New Bucyrus-Erie electrically driven strip mining shovel for Peabody Coal Company will weigh 7000 tons, more than Juneau Class Navy cruiser . . . will tower 213 feet high with 450 feet working range. Mammoth 115-cu-yd dipper is 64% larger than any built to date . . . will move over 200,000 tons of overburden per day, making possible mining of 4,000,000 tons of coal per year.

Current Coal Patents

By: Oliver S. North

Low height shuttle car, J. D. Russell (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Nov. 29, 1960. Design for a high-capacity low-height six-wheel articulated shuttle car with articulating pivot means between two main body parts and conveyor means extending along the compartment bottom. Driven wheels at the center insure correct load weight distribution. No. 2,962,176.

Cutter loader mining machine, J. Anderton (assigned to Coal Industry (Patents) Ltd., London, England), Nov. 29, 1960. Design for a cutter loader mining machine adapted to travel over an armoured conveyor extending along a long-wall coal face. A plow member behind the cutter unit deflects the cut coal onto the conveyor. No. 2,962,271.

Separation of solids from liquids by sedimentation, E. Kuss, D. Remagen, E. Rosin and H. Shcackmann, Dec. 6, 1960. In an improved method for expediting the settling of solids in liquids, e. g. for thickening a fine bituminous coal suspension from a coal washing plant, the material in the intermediate settling zone is subjected to a compression and a kneading action as well as moved by means of a suitable raking mechanism. No. 2,963,157.

Not Assigned

Through error the patent on a mine roof bolting installation system granted to J. B. Dempsey, president, Pattin Mfg. Co., Marietta, Ohio, was described in the November, 1960, issue of *Coal Age*, p. 36, as "U. S. Bureau of Mines Patent No. 2,925,129." Mr. Dempsey calls attention to the fact that the patent has not been assigned and is held solely by him.

Equipment Approvals

Eight equipment approvals were issued by the U. S. Bureau of Mines during the month of November, 1960

Goodman Mfg. Co.—Type 670-10 shuttle car; three motors, two 20-hp and one 10-hp, 415-V, AC. Approval 2F-1591A, Nov. 2.

Goodman Mfg. Co.—Type 670-11 shuttle car; three motors, two 20-hp and one 10-hp, 415-V, AC. Approval 2F-1592A, Nov. 2.

Goodman Mfg.—Type 964-C loading machine; four motors, each 26 hp, 440-V, AC. Approval 2F-1593A, Nov. 3.

Woodward Iron Co.—Self-propelled compressor; three motors, one 40-hp and two 4-hp, 250-V, DC. Approval 2F-1594, Nov. 3.

Mountaineer Coal Co.—Roof-drilling machine; one motor, 25-hp, 440-V, AC. Approval 2F-1595A, Nov. 9.

Mine Safety Appliances Co.—Airslide rock dust distributor, one motor, 10-hp, 440-V, AC. Approval 2F-1596A, Nov. 9.

Goodman Mfg. Co.—Type 2410 cutting machine; two motors, one 60-hp and one 35-hp, 500-V, AC. Approval 2F-1597A, Nov. 10.

Columbus McKinnon Corp.—Type RF-57 ratio feeder conveyor; one motor, 25-hp, 440-V, AC. Approval 2F-1598A, Nov. 25.

Identification Symbol 129-BM was assigned to Narragansett Wire Co. to identify cables that have been accepted by the Bureau of Mines as being flame resistant.

The following fire-resistant hydraulic fluids were approved in 1960 by the USBM under Schedule 30:

Shell Oil Co.—Shell SL-7361 FRM Fluid and *Shell 3XF Mine Fluid. Approval 30-1, Feb. 18.

Celanese Chemical Co.—Approval 30-2 covering Cellulube 220 and 300 on April 18; Cellulube 90, 550 and 1000 on May 3; and Cellulube 150 on July 11.

Socony Mobil Oil Co., Inc.—TL 10 on July 6 and *TL 9 on Sept. 7, by Approval 30-3.

Hulburt Oil & Grease Co.—Hulburt FRF-32, brand changed to Hul-E-Mul. Approval 30-4, July 13.

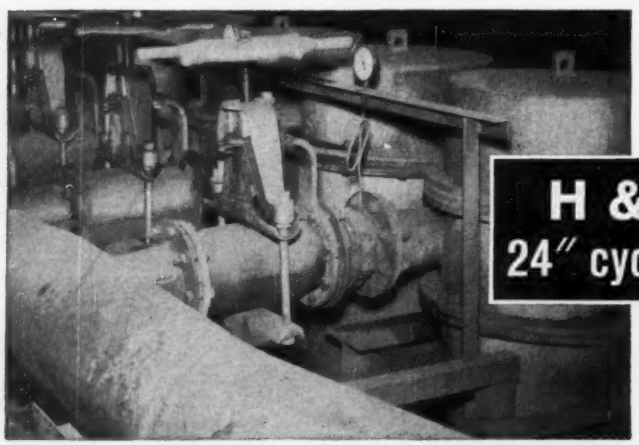
Atlantic Refining Co.—*Hydraulic-FRC by Approval 30-5 on July 19.

Monsanto Chemical Co.—Pydraul F-9 by Approval 30-6 on Sept. 8.

Gulf Oil Corp.—Gulf FR fluid and *Gulf FR concentrate by Approval 30-7 on Sept. 7.

Sun Oil Co.—Sun Minesafe fluid by Approval 30-8 on Oct. 11.

*Concentrate—water to be added by user in accordance to supplier's instructions.



TYPICAL APPLICATIONS . . . highly successful in Coal Preparation Plants

- To replace raw coal or clean coal drag tanks or to supplement overloaded tanks
- To control solids density of feed to wet Concentrating Tables, by-passing minus 100 mesh solids
- To scalp top sizes in Jig Circuits

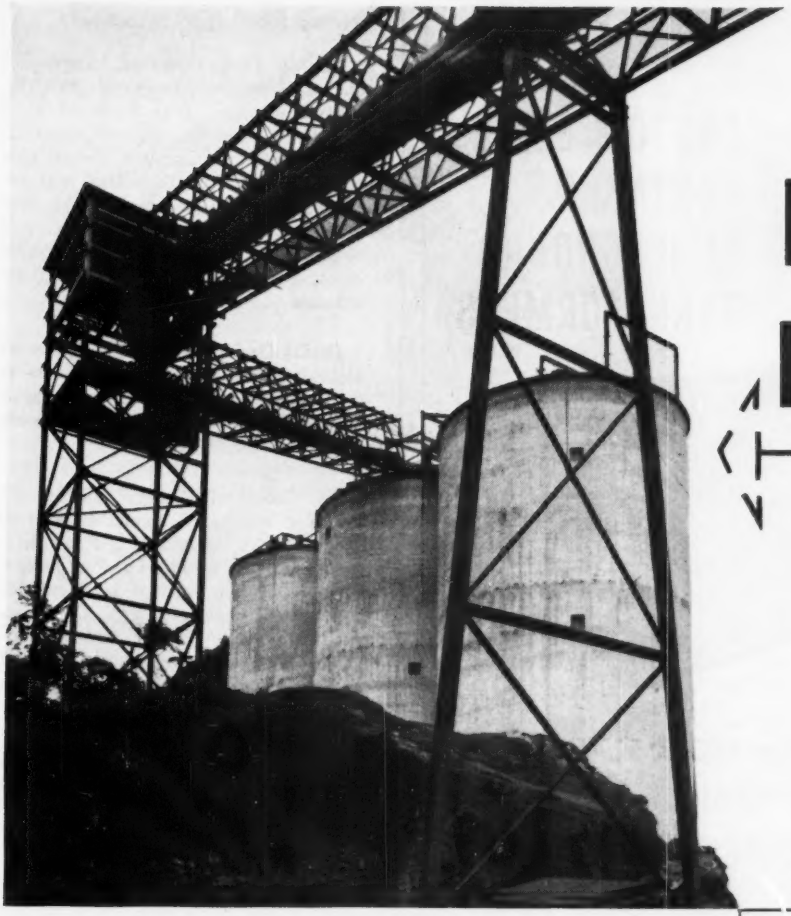
Discuss your applications with an experienced H & P Sales Engineer and then

Specify the best—the H & P Cyclone

H & P Cyclones come in sizes from 1⅛" to 36" diameter

HEYL & PATTERSON, inc.

55 FORT PITT BLVD., PITTSBURGH 22, PA.



Ruttmann has been here

For a large coal company in Southern West Virginia, three 40-ft. I.D. slip-form silos, 83 ft. high

ECONOMY . . . Initial cost competitive with other types of construction.

MAINTENANCE . . . Literally maintenance free. The monolithic reinforced concrete construction eliminates the need for painting to seal joints or to prevent rusting.

SHOCK RESISTANCE . . . Here is a silo that can take the "lumps"—can withstand continual hammering.

VERSATILITY . . . Slip Form or Jump Form construction. Single or multiple installations—with or without interstice bins. No need for expensive substructures where an elevated bin is desired—just block out the truck or rail passageway and suspend the bin bottom at the desired height.

Monolithic Concrete Construction

Specializing in Vertical Concrete Construction Slip Form and Jump Form

RUTTMANN CONSTRUCTION CO.

425 W. WALKER STREET
UPPER SANDUSKY, OHIO
PHONE: AX. 4-3538

ENSIGN -- CUSTOM BUILT PORTABLE UNDERGROUND TRANSFORMERS

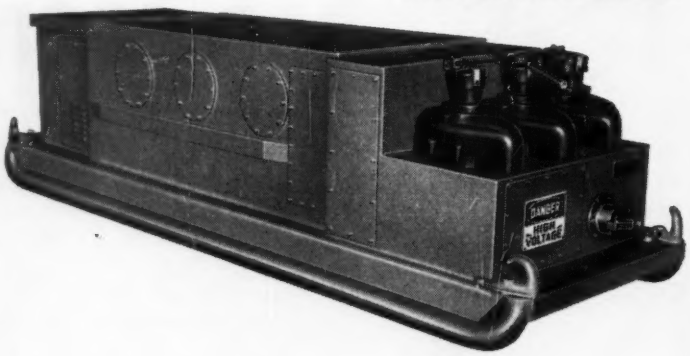


Photo illustrates 225 KVA Nitrogen Filled Unit 7200 Volt Primary-36" High

Units are of rugged construction with pipe or flat channel type skid base to withstand severe handling.

Available in nitrogen filled or ventilated types . . . coils are Class H silicone insulated to give high moisture repellancy and thermal stability.

Units available in sizes 75 through 600 KVA . . . complete with standard components with such special features as desired by purchaser.

"PRODUCT OF ENSIGNEERS"

ENSIGN
ELECTRIC AND MANUFACTURING CO.
914 Adams Avenue Huntington 4, W. Va.

News Roundup (*Continued*)

Hazard Coal Operators Association elected as president **Joseph M. Richards**, general manager, Blue Diamond Coal Co. **C. E. Fannin**, general manager, Carrs Fork Coal Co., was elected vice president and **Fred B. Bullard** was re-elected executive secretary. **F. M. Medaris**, president, Harvey Coal Co., was elected honorary director in recognition of more than 30 yr service to the association.

Harlan Coal Operators Association re-elected Cloyd D. McDowell as president and treasurer, Mrs. Sherman Howard as secretary and Rufus J. Bailey as safety director.

The Society of Mining Engineers will install at the AIME annual meeting in St. Louis Feb. 26-March 2, **Edward G. Fox**, president, Bituminous Coal Operators Association, as vice president for the Eastern Region for 3 yr. **Dennis L. McElroy**, executive vice president, Consolidation Coal Co., will also be installed as a director representing the Coal Div.

Southern Coal Producers' Association has reelected **C. W. Davis** president, **John F. Lane** secretary, and **Laurence E. Tierney Jr.** treasurer. The membership also returned to office the entire executive committee.

Obituaries

George S. McCaa, 76, retired state mine inspector, died Nov. 28 in Pittsburgh, Pa. Mr. McCaa was associated with the coal industry virtually all his life, having been employed by the Bureau of Mines for a period of 14 yr and a state mine inspector for 30 yr. He served as president of the Coal Mining Institute of America from 1935 to 1937. Mr. McCaa, who developed the McCaa oxygen-breathing apparatus, was founder of the National Mine Rescue Association and helped in rescue and recovery work in 400 mine fires and explosions in bituminous fields.

Domenic Stanchina, 62, chief of the Ohio division of mines since 1957, passed on Nov. 12 after a 5-mo illness. Mr. Stanchina started out as a coal miner and after holding several positions as an official in the mines, he became a deputy state mine inspector.

Percy Tetlow, 84, former chairman of the Bituminous Coal Commission and more recently a special representative of the UMWA, died Nov. 19 in Columbus, Ohio. Mr. Tetlow was a charter member of the UMWA and a long-time associate of John L. Lewis.

Plan Atomic Power Plant

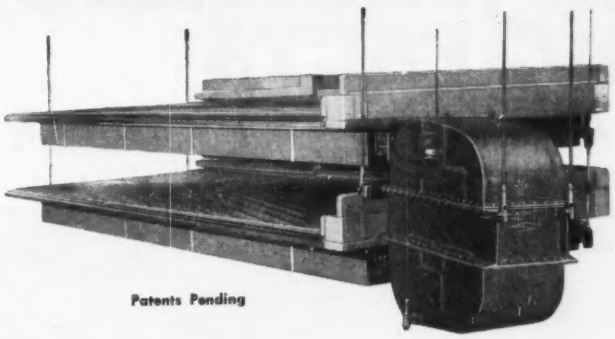
Seven New York State utilities picked General Electric Co. and General Dynamics Corp. to develop two competing atomic power plant concepts as a preliminary step toward building a full-scale commercial nuclear power plant. If either proves competitive, the utilities plan to build the atomic plant in New York State. It would have a capacity of 300,000 to 500,000 kw and would go into operation around 1968. Power produced by the nuclear plant is expected to be in the price range of conventionally-produced electricity in New York, or about seven mills per kwhr.

UMWA Local Restrained

Tennessee Consolidated Coal Co. (Tenn.) was awarded a contract last August for $150,000 worth of coal for the Navy, to be produced by Grundy Mining Co., a subsidiary. According to NLRB Examiner Whittemore, UMWA Local 5881, which had until last spring operated mines with Consolidated, "were somewhat less than kindly disposed toward the move initiated by Grundy . . . to open new Consolidated mines" using members of the rival Southern Labor Union. The board's general counsel said many UMWA members who gathered at the new mine site, made threats, ejected the superintendent, assaulted an organizer of the rival union and warned away new employees who did not return. The examiner found unfair labor practices in violation of the act and recommended UMWA Local 5881 be ordered to desist from assaulting or threatening with violence Grundy employees to prevent them from operating mines.

Rubber Plant To Use Coal

About 150,000 tons of coal will be used to fire two Riley Turbo-Furnace boilers, each with a capacity of 175,000 lb of steam per hr, at a new plant near Marietta, Ohio. December, 1961, will mark the start of production at the new plant which will manufacture polyisoprene—described as "man-made natural rubber." Joseph W. Eberman, senior engineer of Shell Chemical Co., a Div. of Shell Oil Co., visited National Coal Association Marketing Dept. officials recently to discuss boiler plant layouts and coal and ash handling equipment for the plant.



Patents Pending

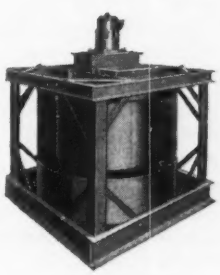
Double Deck Your Washing Section and Save New Plant Cost.

With the new CONCENCO® "77" twin deck coal washing table you can do just that . . . unless you need to expand your capacity more than twice.

The "77" table with two identical decks operating one over the other enables you to prepare twice as much coal in the same unit of floor space as was formerly possible with the most efficient single deck table on the market.

You can therefore expand your capacity to fit your need . . . one table at a time . . . or by double-decking your entire battery . . . without the cost of one square foot of extra floor space.

The economy is obvious. Acceptance has been little short of sensational. For full information send for Bulletin 77.



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While unexcelled for feeding coal washing tables, the CONCENCO Feed Distributor effectively provides an accurate splitting of feed into any desired number and proportion of parts to feed circuits or machines in battery for their greater overall efficiency It is a heavily fabricated all steel machine with motor drive requiring 1 h.p. or less in operation.

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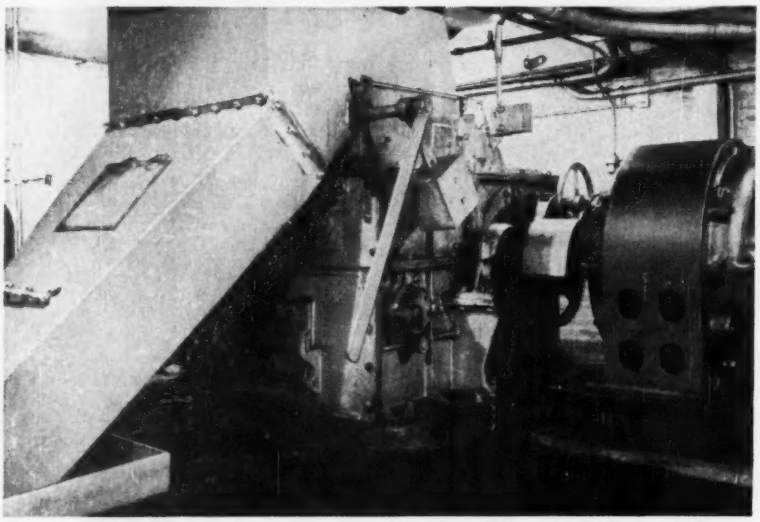
from *American* PULVERIZER CO.



USER REPORT

"7,000,000 TONS OF COAL reduced to 3/4" by this crusher, and it is still going strong"

After 23 years of operation, this American AC Rolling Ring Coal Crusher is still giving excellent service.

Replacement parts, plus standby parts, for reducing 7,000,000 tons of coal have cost less than 1/5 of a cent per ton. **Quality is proven only by performance.**

There are solid engineering reasons for this performance. The crushing elements, composed of American-originated rolling shredder rings, split coal instead of crushing it. This means less wear on screens and liners, less attrition in the crushing chamber. The rings are manganese steel and are reversible to give double wear. Liners are easily replaced.

The entire rotor assembly and bearings are so carefully machined, aligned and balanced that a nickel will stand on edge when the crusher is operating!

You can depend on performance like this when you use an American Coal Crusher. Our engineers will advise you on the correct model for your reduction problem.

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Pa. Mine To Tap Large Reserve

A capacity of 2,000 tpd in early 1961 is expected at the new Cadogan No. 2 Mine of the Allegheny River Mining Co., Kittanning, Pa., about to open. In order to tap a reserve of more than 25 million tons of Lower Kittanning coal, it was necessary to drive through a fault approximately 3,500 ft wide. Main headings are now through the fault and the company is in process of turning and driving several production headings.

Name Change

A change of firm name from Ferguson-Gates Engineering Co. to Gates Engineering Co. has been announced by Leslie C. Gates, P. E. The West Virginia firm offers a complete engineering service as consulting, civil and mining engineers. Location of the company's two offices are: Prince at Kanawha, Beckley; 1033 Quarrier St., Charleston.

Canadian Strike Averted

Western Canada coal operators honored a conciliation board award and thus averted a crippling strike for a reviving industry. The Western Canadian Coal Operators' Association and Dist. 18, United Mine Workers of America (CLC), announced the signing of a new 2-yr agreement affecting 1,600 men in five Alberta and British Columbia coal mines. Retroactive to July 3, 1960, the work agreement provides a pay increase of 5c per hour for the 1960-61 term and another 5c increase for the 1961-62 term.

Mines, Companies

Elliot Coal Mining Co., Inc., Philipsburg, Pa., has moved to its newly completed modern design building on the property of the company's cleaning plant. The new address is P. O. Box 25, Osceola Mills, Pa.

Glen Alden Corp. has sold coal rights at Empire and Stanton Colliery yards to a group of investors. The coal, mostly fine sizes, was dumped about the grounds as fill years ago when there was no demand for stoker and powdered coal. A tremendous supply is believed to exist under the rockpile at the Stanton yards south of Hazle St., Wilkes-Barre, Pa. It

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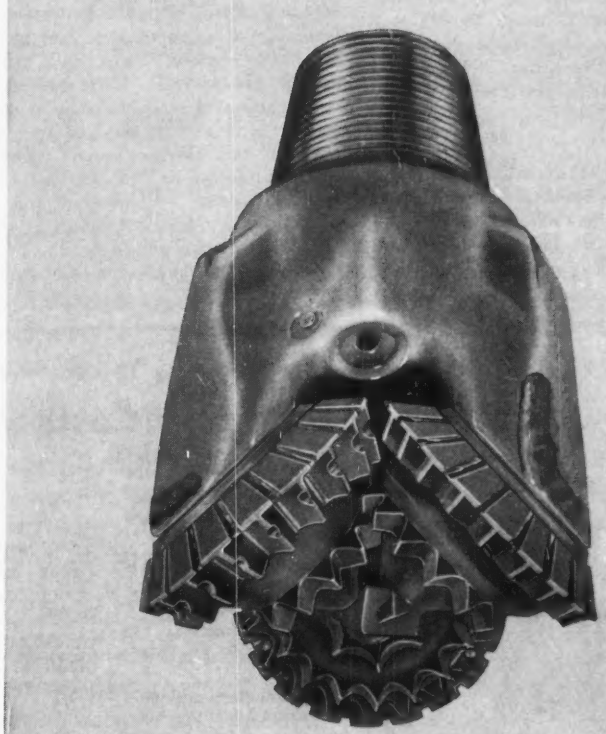

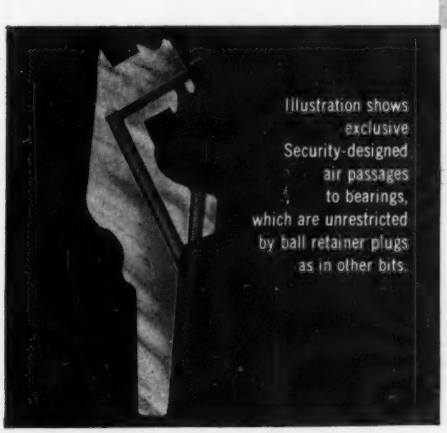

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is expected to be a profitable venture in view of the fact that changes in market conditions in recent years has resulted in great demand for fine sizes for commercial use.

Independent Coal & Coke Co., Utah's largest commercial coal operator, has reported a net loss of $190,873 for the first 9 mo of 1960. W. J. O'Connor, president and general manager of the firm, said that this compares with a profit of $85,351 for a comparable period in 1959. He told shareholders, however, in an interim report, that the firm would end the year in the black and that the loss was occasioned by increased expenditures resulting from connection of the Kenilworth and Castle Gate mines (*Coal Age*, November, 1960, p 50) and development of the "C" seam. Mr. O'Connor also announced that the company is now merchandising the "Stokermatic" residential stoker in the Pacific Northwest.

Construction of a coal-loading dock is the reported intent behind the purchase by Ayrshire Collieries Corp. of a 56.8-acre tract of farmland bordering on the Illinois River near Frederick, Ill., at a cost of $30,000. The mining firm, which has also purchased the 40-acre Monroe Lenhart estate farm in Littleton Township, Ill., for $8,200, has reportedly acquired options on nine farms totaling 1,500 acres in Littleton and Oakland townships for their mining interests.

U. S. Steel Corp. has announced that operations at four of its oldest mines in Fayette County will not be resumed because of depletion of minable coal. The four mines—Bridgeport, Colonial, Leisenring No. 3 and Maxwell—were placed on a standby basis last May. Last October the company's Collier mine was closed also because coal reserves were exhausted.

Public Service Co. of Albuquerque, N. M., has formed a subsidiary, Public Service Coal Co., to explore the economic feasibility of using coal as fuel at its generating stations. Faced with rising natural gas prices, a PSC spokesman said "There will probably come a point when it is cheaper to use coal as fuel." He said the company's new stations would probably be designed for coal use and existing stations converted as they become obsolete. Public Service presently uses gas exclusively with oil as a standby.

Coming Meetings

International Symposium on Mining Research, Feb. 22-25, 1961—University of Missouri, Rolla, Mo. Among subjects to be covered at the sessions are drilling, blasting, and roof support. Two of the many papers of interest to be presented are "Recent Research in Degasifying a Coalbed Before and During Mining" by William M. Merritts, USBM, and "A Theory of the Basic Mechanics of Coal Ploughing" by I. Evans, National Coal Board, England. Welcoming addresses will be given by Curtis L. Wilson, dean, Missouri School of Mines & Metallurgy, and Marling J. Ankeny, director, U. S. Bureau of Mines.

AIME Annual Meeting, Feb. 26-Mar. 2, 1961—Ambassador and Chase-Park-Plaza Hotels, St. Louis, Mo.

Fourth Symposium on Rock Mechanics, Mar. 30-Apr. 1, 1961—Pennsylvania State University, University Park, Pa.

Sixth Annual Appalachian Underground Corrosion Short Course, June 6-8, 1961—West Virginia University, Morgantown, W. Va.

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Reduce Preparation Costs with a RIDGE AIRJIG

- **Complete, compact unit can be transported on one truck.**
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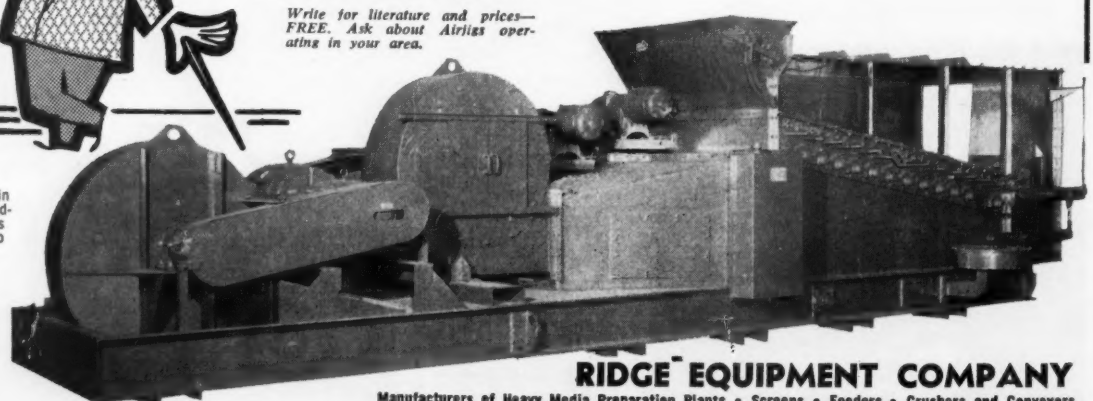

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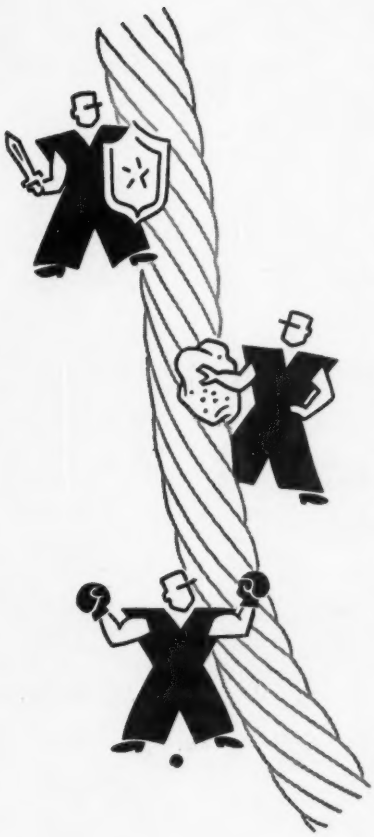
DOUBLE GRAY-X®

...the wire rope with the

EXTRAS



First — because it's made of *extra* improved plow steel — Double Gray-X has *extra* high breaking strength (15% higher than the catalog breaking strength of non-premium ropes of the same construction). Second — due to Wickwire's new wire drawing process — Double Gray-X gives *extra* long service. Double Gray-X has:

MOLECULAR SHIELD

The use of molybdenum disulphide in the wire drawing results in a shield several molecules thick which lubricates the individual wires and prevents them from grinding against each other when the rope operates. Less internal friction means more rope life.

SMOOTHER WIRE SURFACE

Before Double Gray-X, the most carefully drawn rope wire contained minute surface imperfections. Wickwire's new wire drawing technique improves the surface finish. Smooth surfaced wires provide better resistance to fatigue.

EXTRA TOUGHNESS

Molybdenum disulphide lubricates the wires during the drawing process. Less power is required and less heat is generated during this operation. The original inherent toughness of the wires is better preserved.

Double Gray-X is available in many different sizes and constructions. To reduce your operating costs, you should insist on Double Gray-X. For complete information, contact your local Wickwire distributor. We'll be glad to give you his name and address. Write to Wickwire Spencer Steel Division, Wire Rope General Sales Department, P.O. Box 232, Palmer, Mass.

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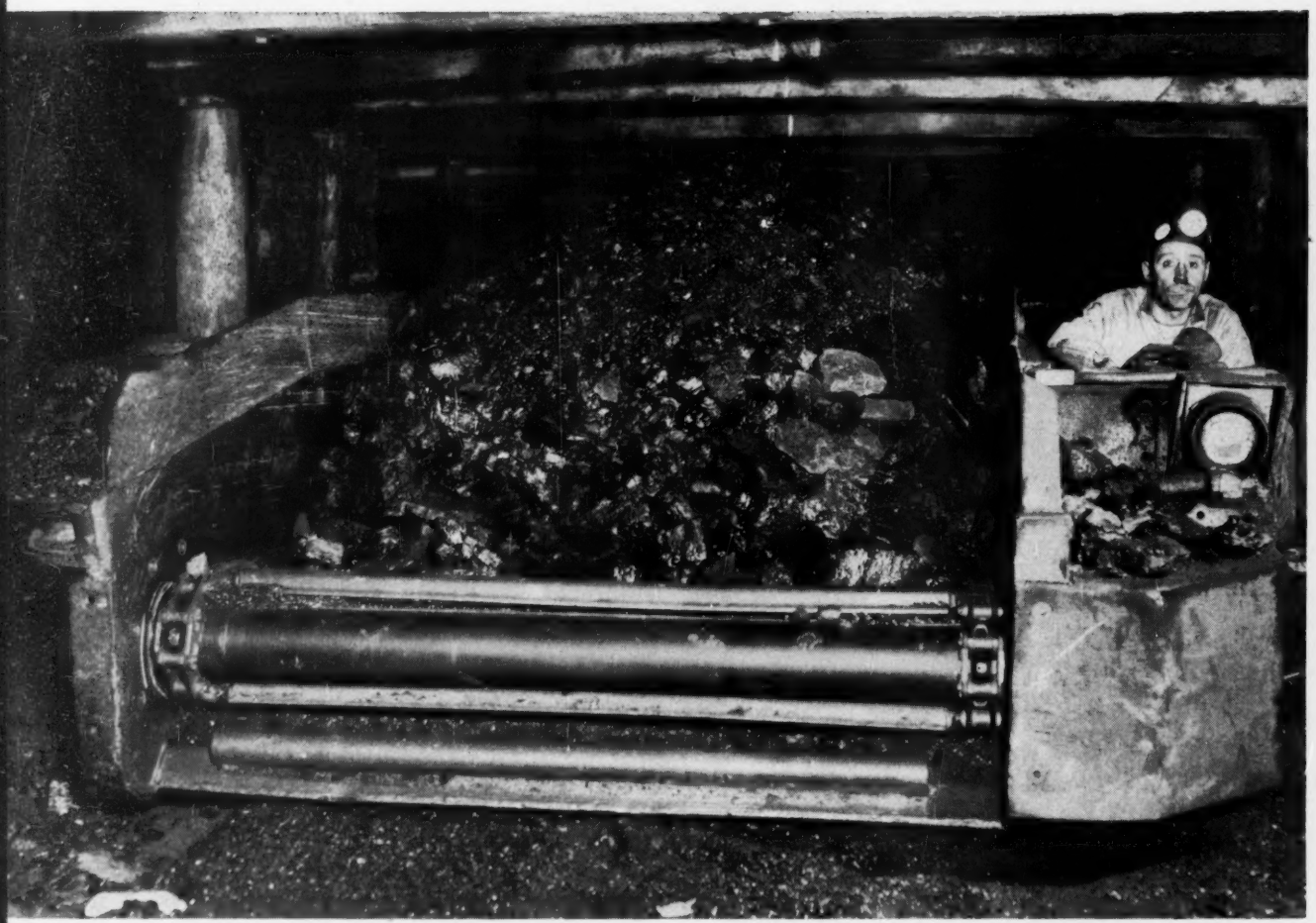
AT CENTRAL APPALACHIAN COAL:

OPERATORS LIKE THE WAY MANAGEMENT LIKES THE



Mine management likes the big load, and the quick trip time of these new 18SC-2 Shuttle Cars.

Joy 18SC-2 six-wheeled Shuttle Cars have proven popular with both operators and management at the Central Appalachian Coal Company. Operators like the comfortable, safe ride between the wheels, and the easy way they handle. This results in cutting trip time substantially. Mine management likes the big load the 18SC can carry. Operating in 60″ seams, a 32″ car with 6″ sideboards is hauling over six tons per load, up grades as steep as 12%.

The Joy 18SC-2 cars at Central Appalachian are part of a complete line of six-wheeled shuttle cars available from Joy. In any low or medium seam from 30″ to 54″, these cars cut your haulage costs with shorter trip times and bigger loads than any conventional car can provide. Let your Joy representative give you complete details on these cars, or write for Bulletin 2611-1.

THE 6 WHEEL 18SC RIDES... BIG LOAD IT CARRIES

Operators like the ease of handling, and the safe comfortable ride in the Joy 18SC Shuttle Cars. Hinged center enables car to take bumps and dips in stride.

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING MACHINERY

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Joy Manufacturing Company
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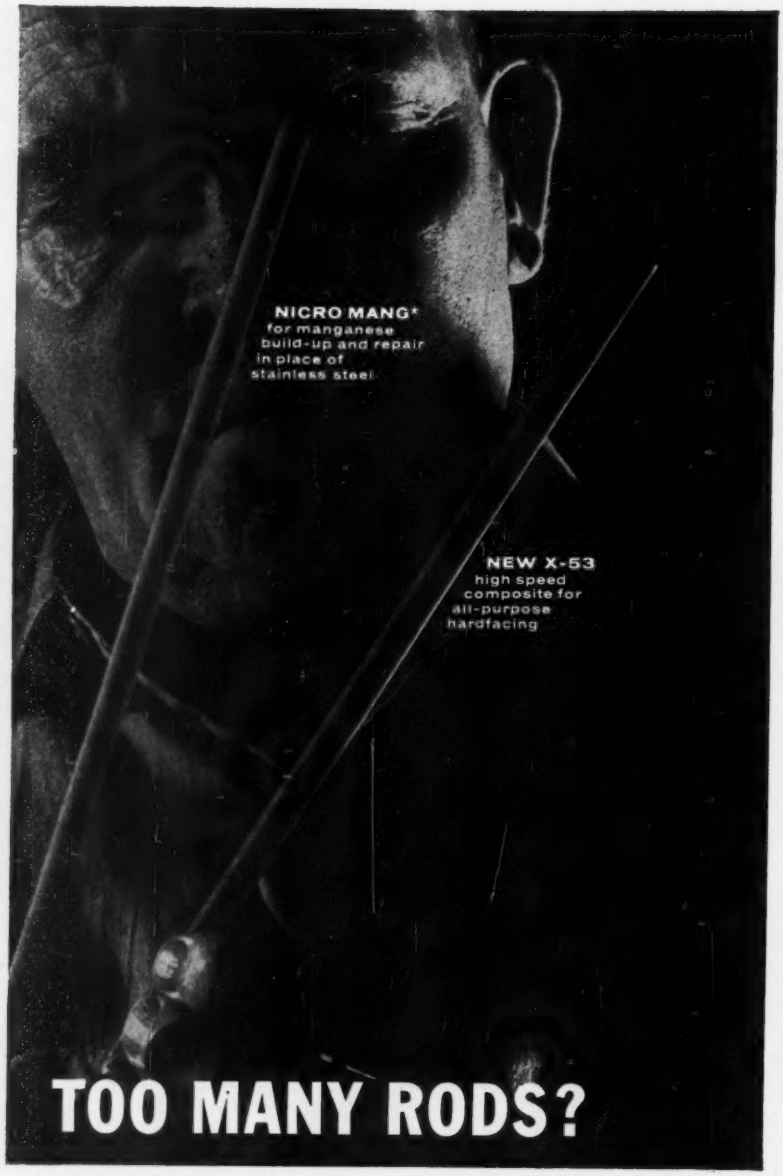

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There's no need to "buy the catalog" when the "Pair for Wear" can handle 90% of your build-up and hardfacing work. Use the "Pair for Wear" wherever you need high impact and abrasion resistance. *Standardize* on them.

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News Roundup (*Continued*)

Wilmore Coal Co., an affiliate of the Berwind-White Coal Mining Co., has donated 136 acres in Richland Township, Pa., to the University of Pittsburgh as a site for its new Johnstown College. Dr. Edward H. Litchfield, University of Pittsburgh chancellor, said the site is excellently situated for a campus and is ideal for development of a full-scale undergraduate adjunct to the university.

Usibelli Coal Mines, Inc., Usibelli, Alaska, has purchased assets of Suntrana Mining Co., Suntrana, Alaska, which include unmined coal as well as tipple and trackage facilities. These items wil replace older equipment at the Usibelli properties and speed loading of coal cars. The sale is expected to result in lower coal costs for Fairbanks.

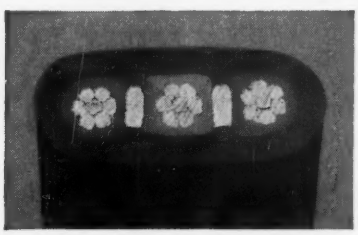
Utilization

The idea that Canada can find new coal markets through the blending zest, usually associated with the tea and tobacco trades, was pushed at the Dominion-Provincial coal research conference. Canadian penetration of the market for coke for Japanese steel mills was lauded as an example of successful application of the approach. W. E. Uren, chairman of the Dominion Coal Board, said Canada found the way in applied science when it set out 3 yr ago to develop an export market in Japan. On the same theme, J. C. Botham, a senior scientific officer of the mines department, said recent proposals for the development of a steel industry in Western Canada together with the export of coal to Japan from the Crowsnest Pass region of Alberta and British Columbia has led to renewal of interest in the coking properties of Western Canadian coals. Japan produces coking coals, but they must be blended with imported coal to produce coke of the right quality for steelmaking. Results of Canadian research coupled with extensive studies by the Japanese steel industry are expected to result in shipment of approximately 500,000 tons of Canadian coal to Japan in 1960 for use in blends with other coals for the manufacture of blast furnace coke. Mr. Botham of the fuels and mining practice division of the mines branch, noted that because Canadian reserves of coking coals are extensive but are not handy to the steel centers of central Canada, only 14% of the total coke manufactured in Canada in 1959 originated from Canadian coals.

The new $2.5 million plant near Kemmerer, Wyo., to make coke from

Increasing demands for higher voltages—and increasing investments in modern, high-powered machinery—demand an extremely reliable, field-proven cable. The new Anaconda AC Shuttle Car Cable fulfills these requirements.

FOR ASSURED CONTINUITY OF PRODUCTION AND MAXIMUM OUTPUT—NEW ANACONDA AC SHUTTLE CAR CABLE



Here's proof:

After two long years of severe service in the Independent Coal and Coke mines of Carbon County, Utah, Anaconda AC Shuttle Car Cable is still in excellent condition—real testimony to its reliability and long-range economy.

Since lost production due to cable failure often costs more than the original cable investment, this new cable can pay for itself many times over.

The construction features which assure reliability

1. Parallel three-phase construction which makes phase-to-phase shorts almost impossible. This flat construction also gives excellent protection against the damage of runovers. Also permits more efficient reeling. An original Anaconda design.

2. Breaker strips of tough Nylon prevent grounding wires from abrading and cutting the insulation. A patented Anaconda exclusive.

3. All Neoprene construction—results in a flame-retardant, crush-resistant cable. The first cable with all Neoprene insulation and jacket.

4. Nylon web reinforcement between cable assembly and outer jacket provides increased resistance to mechanical damage.

5. The special grounding wire construction permits the use of ground-type relay systems when desired.

All these construction features have been proved after extensive laboratory testing and tough field service.

Find out more about Anaconda AC Shuttle Car Cable. Call or write your nearest Anaconda district office, or The Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

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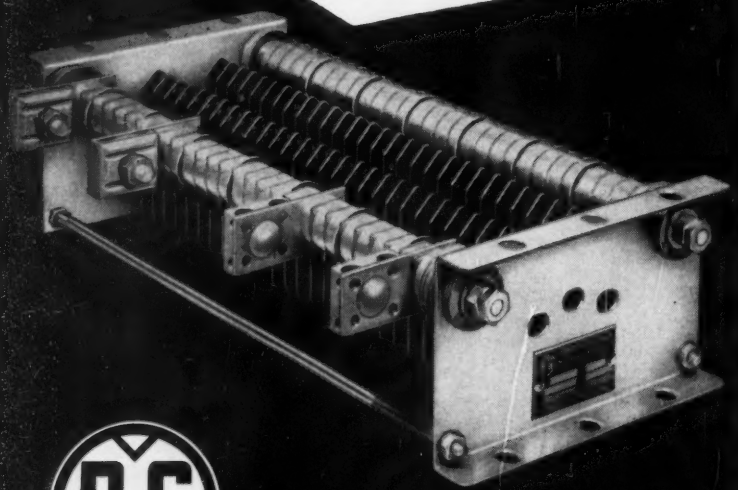

P-G Resistors have proved this for many years

Different, because steel and mica, both extremely durable materials, coupled with P-G exclusive design produce a resistor of great mechanical strength. There is nothing to break. With accurate resistance values and adequate carrying capacities, P-G Resistors outlast ordinary resistors. Tell us your specifications and let P-G solve your resistor problem.

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News Roundup *(Continued)*

the region's coal, was put to test recently and hailed as successful. While a number of mechanical bugs developed, an industrial grade of coke was produced that stood up under reduction furnace pressures. The project is the joint effort of Food Machinery & Chemical Corp., San Jose, Calif., and U. S. Steel Corp.

W. T. Thagard has been elected a vice president of the Texas Transmission Corp. to direct the Houston company's diversification into the field of carrying coal by pipeline.

Preparation Facilities

Bethlehem Mines Corp., Mine No. 41, Barrackville, W. Va.—Contract closed with Jeffrey Mfg. Co., for 3-cell extension for existing Jeffrey Baum jig.

Bethlehem Mines Corp., Mine No. 44, Idamay, W. Va.—Contract closed with Jeffrey Mfg. Co. for 3-cell extension for existing Jeffrey Baum jig.

Cherry River Coal Co., Fenwick, W. Va.—Contract closed for installation of Dorr-Oliver "fine coal" Fluosolids dryers with Ducon cyclones.

Eastern Gas & Fuel Associates, W. Va.—Contract closed for installation of Dorr-Oliver "fine coal" Fluosolids dryers with Ducon cyclones.

Carbon Fuel Co., Winifrede Mine No. 6.—Contract closed with Kanawha Mfg. Co. for rail loading and automatic sampler equipment to treat sizes 1¼x0 coal, capacity 350 tph.

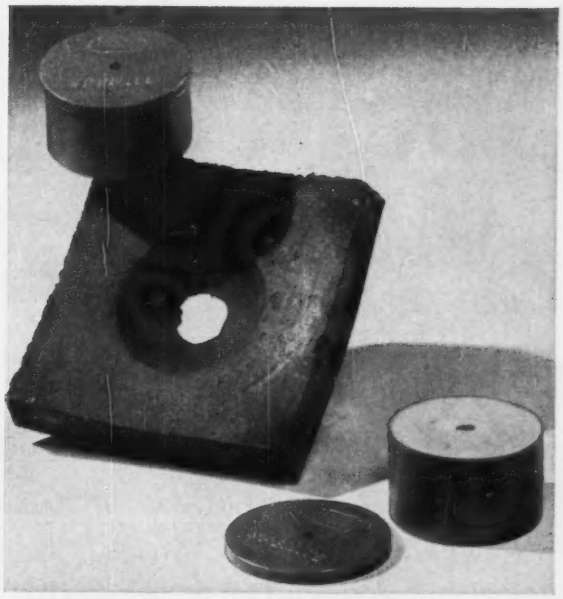
Clinchfield Coal Corp., Moss No. 3 preparation plant, Dante, Va.—Contract closed with Kanawha Mfg. Co. for installation of drying and conveying equipment to handle a middlings product, capacity 85 tph.

Rice Bros. Coal Co., Osceola Mills, Pa.—Contract closed with Ridge Equipment Co. for complete, 150 tph Ridge Airjig preparation plant including Ridge variable feed feeders, 8x12-ft rotary breaker, three Ridge Airjigs, screens and crushers.

Crystal Block Coal Corp., Huntington, W. Va.—Installation completed by Ridge Equipment Co. at Thacker Mine for Ridge Airjig and C-6 dust collecting system. Plant processing 75 tph of ¼x0 coal.

Valley Coal Co., Heilwood, Pa.—Installation completed by Ridge Equipment Co. for Ridge Airjig to handle 55 tph of ⅜x0 coal.

Extra easy to load, you simply thread the new SPENITE Explosive Boosters on detonating cord. Knot holds Spenite boosters in place when cord is lowered in hole.



The hole blasted in this inch-thick steel plate is dramatic proof of the energy developed by the new SPENITE booster. Read about it below:

New Spencer Development Slashes Cost Of Boostering Ammonium Nitrate-Fuel Oil Blasts

Advanced high-efficiency booster called SPENITE* is first material specifically designed for use with this low-cost explosive

Pioneers in money-saving ammonium nitrate-fuel oil explosives, Spencer Chemical Company now introduces SPENITE—a revolutionary new boostering material that cuts blasting costs even further!

Spencer SPENITE Boostering material is specially formulated to detonate ammonium nitrate-fuel oil mixtures. By developing the best blast characteristics of this economical explosive, SPENITE offers two important advantages:

1. SPENITE cuts explosive costs by lowering the cost of detonating materials and reducing the number of boosters required per hole.
2. SPENITE provides maximum blast efficiency by generating more intensive explosive heat.

This remarkable discovery is based on test results which indicate that for efficient boostering of ammonium nitrate-fuel oil mixtures, the heat which the booster generates is more important than the velocity of the detonation. Explosive heat generated by the SPENITE booster is at least 50 per cent greater than with other commercial boosters.

Package is specially-designed, round plastic containers, SPENITE boosters can easily be threaded on 50-grain detonating cord at desired intervals. The hole can then be filled with Spencer N-IV Ammonium Nitrate-fuel oil mixture, stemmed, and shot in the conventional manner.

Free technical assistance is available from Spencer to acquaint you with the cost-cutting advantages of new SPENITE boostering material and Spencer N-IV Ammonium Nitrate as well. Mailing this coupon now can guide you to big saving on blasting materials.

*SPENITE is a trademark of Spencer Chemical Company.

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Devoted to the Operating, Technical and Business Problems of
The Coal-Mining Industry

COAL AGE

JANUARY, 1961

IVAN A. GIVEN, EDITOR

No Glitter—But, No Gloom

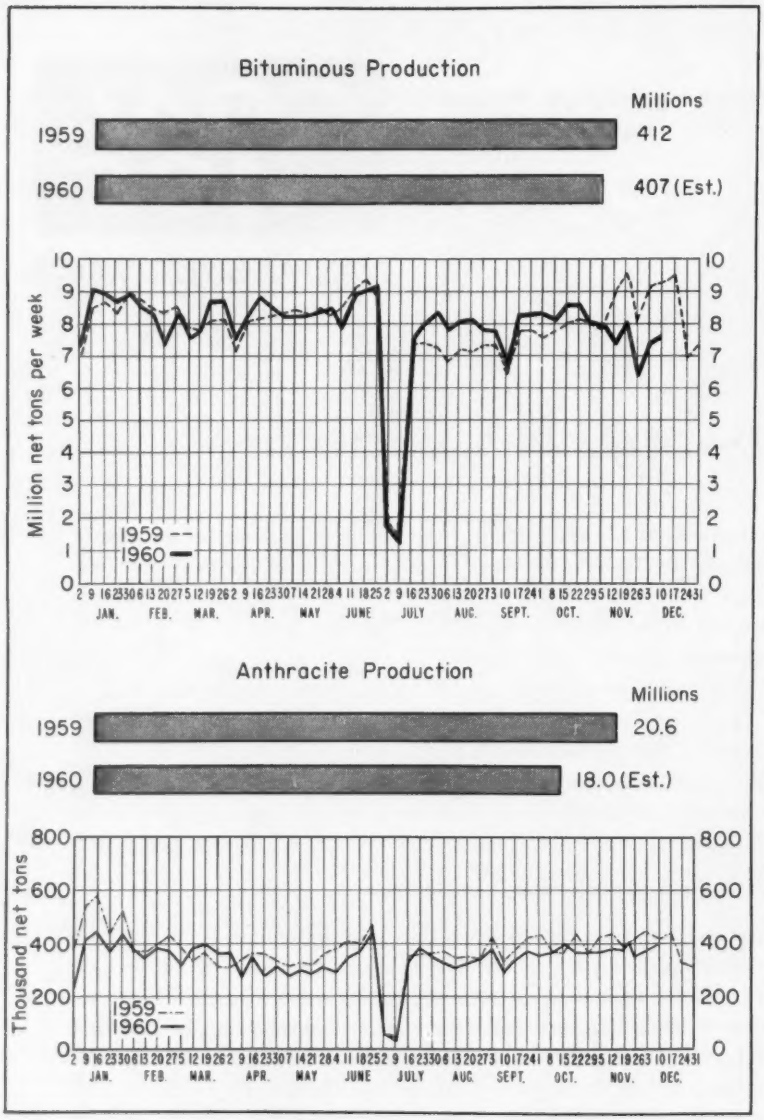
Not good but then again not too bad perhaps is a thumbnail summary of the course of the bituminous industry in 1961. Production dragged through another twelve months and one has to go back to 1954 for a lower yearly total, since the nosedive in December took the industry below the 1959 output of 412 million. As a result the inevitable adverse pressures were intensified, but at the same time the industry marked up some substantial plusses that should stand it in good stead when recovery begins.

For anthracite, however, the plusses were hard to come by, though considering everything the industry is showing considerable fight still. But a 2½-million drop in tonnage was a stiff jolt, especially when there is nothing in the future picture to indicate that the decline can be halted, let alone reversed. Competition first and weather second continued as anthracite's big hurdles.

The failure of business to get back on the track did it for bituminous. Competition apparently failed to make gains for the first time in many years. This is about the only conclusion that can be drawn from data on consumption by major classes. Utility and steel consumption rose in 1960, but there was somewhat of a surprise in the fact that general industry dropped only slightly, while there was a rise in deliveries by retail dealers—contrary to the trend of some years. Perhaps this competitive recession may turn out to be only a one-year thing, but there is reason to feel that it could mark the beginning of a trend.

Bituminous realization was forced down somewhat, and considerable capacity was squeezed out of the industry—a lot of it permanently. But managerial statesmanship prevented the panic sacrificing that used to be the hallmark of recession in coal. Increased emphasis on merchandising, promotion and industry integration for more-effective operation were among the steps that should improve coal's competitive power when recovery comes—along with significant quality improvements and cost reductions again marked up in 1960.

Ahead—in 1961 and beyond? Continued slow for the first half apparently is accepted by the forecasting experts as the order of the day. Then the pickup. So 1961 may again prove a low-tonnage year, though it should be somewhat better than 1959 and 1960 if the economic guessing proves correct. Beyond 1961, coal's growing competitive power, the increasing difficulties being encountered by oil and gas, the growth in population, and the continued rise in the standard of living in the United States means that coal will have to grow steadily and significantly. Pessimism certainly is not warranted.



PRODUCTION STANDOFF for bituminous, 1959-60, reflected the slow pace of business. A further major drop for anthracite was compounded of increased competitive inroads and warm weather.

The 59-60 Coal Picture

1960—Slightly under 1959 for bituminous: for anthracite, another drop of 15%.

1961—No change to a modest increase for bituminous; a further drop for anthracite.

And Beyond—Sustained growth for the indefinite future for bituminous.

IN 1960, as always, the production rate was the major factor in affairs in both divisions of the coal industry. A nosedive in December brought bituminous output down to an estimated 407 million tons, compared to 412 million in 1959. Anthracite took another real licking in the form of a 2½-million-ton 15% loss in output to around 18 million, compared to 20.6 million in 1959.

The consequences for bituminous included:

1. Further pressure on and a further drop in realization. However, there was no price panic, in contrast to past periods of recession, largely because of the increased stability afforded by greater concentration of output in fewer and larger companies and the refusal of management to be stampeded into uneconomic cuts. Major gains on the cost-reduction front were a further help.

Compared to $4.77 in 1959, the average value of bituminous coal at the mine probably dropped to around $4.65 in 1960.

2. Further reduction in industry producing capacity – probably to around 500 million a year "practical" without overtime, though some put the figure at as low as 450 million. Probably the major losses were taken by one- or two-mine small- to medium-sized companies, which had been going out of the picture at an increased rate even before the recession, leaving the field more and more to the big producers at one end and small "truck-type" operations at the other.

3. An almost record low in new mine starts. The dead postwar low in modern times was 1958, with 1960 next.

For anthracite, the consequences included:

1. A further drop in realization from the average of $8.35 in 1959.

2. Additional casualties among both independent and old-line producers, including the taking over of the properties of Hudson by Glen Alden.

Causes? In anthracite, in addition to the general recession, further competitive inroads and much-warmer-than-normal weather. In bituminous, the normal competitive pressures continued to be felt but the big factor was the business recession, and particularly the low rate of steel output. Increased utilization efficiency,

again with steel as a shining example, was a supplementary factor in keeping down demand. Now, for example, some hold that the old rule-of-thumb figure of 1 ton of coal for 1 ton of steel should be revised to 0.8 ton or perhaps less.

Consumption by major groups in 1959 and 1960 was as follows (estimated for 1960):

	Millions of Tons	
	1960	1959
Electric utilities	172	166
Steel (coke plants and steel mills)	89	86
Industrial (railroad, cement, other mfg.)	82	85
Retail deliveries	30	29
Total U. S. consumption	373	366
Canada-Mexico	12	12
Overseas	25	25
Total, consumption and export	410	403

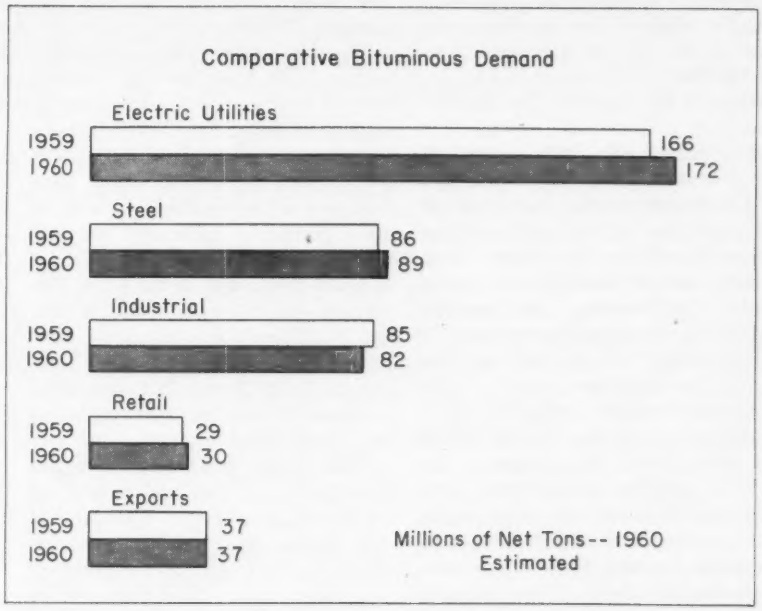
A buildup of 3 to 4 million tons in stockpiles, with utilities a major factor, was another 1960 development. As of Oct. 30, total bituminous stocks were 76.2 million tons, compared to 72.6 million a year earlier.

Ahead in 1961

For anthracite, a return to colder weather would help, but in view of its relatively lower competitive strength vis-a-vis gas, oil and bituminous electricity, a further decline in 1961 must be accepted as probably inevitable.

For bituminous, the course of business will tell the tale. At the moment few economic forecasters see any pickup immediately. The majority, in fact, anticipate a further drop in the business rate in the first half of 1961, and then a turnaround in the second half. If this proves to be a reasonably accurate appraisal, bituminous could expect to do no better than hold its own in the first 6 mo of 1961, could look to only the last half for any pickup that might be experienced.

On balance, on the basis of present views as to industry course, any increase in the production total in 1961 will be modest at best, barring a sudden bulge not now in the cards. If the turnaround should be late, perhaps coal could do no more than hold its own. Summing up, perhaps the best guess is anything from no increase to perhaps 10 million tons or so in 1961.



HOW BITUMINOUS DEMAND stacked up in 1960, compared with 1959. Only drop of consequence was in general industrial requirements.

The Farther Future

Though a waiting game must be played in bituminous production the situation is not without its favorable factors. The increased pressure to cut costs which recessions always generate is being reflected in major advances. Equally significant advances are being made in quality, sales and engineering services, though more research could be advantageously brought to bear on the utilization foundation of market development. The railroads are contributing significantly through freight-rate adjustments.

Speaking of competition, natural gas remains the biggest thorn in the side of coal—in addition to the trouble it is giving oil also. But signs can be seen of a reversal—in part at least—of the tide. Except in some key, areas, such as, the Atlantic Seaboard target of the residual importers, the oil-tide ebb already has started.

Utilization efficiency—in utilities and steel in particular—will continue to be a factor in coal-production totals, but there is little prospect that anything (nuclear fuel, direct reduction and the like) can knock coal out of its position in these two industries. Cost and improved burning equipment are improving coal's position in general industry. In the export field, coal's market is almost entirely metallurgical, which cannot be obtained from other sources. Consequently, exports may be classed as a stable outlet of considerable importance.

Translating these conclusions into production targets, several rates of bituminous growth can be postulated. The optimists see up 7% or so annually as the increase in output in the next several years. A few pessimists see nothing. What might be termed the middle-of-the-roaders see a rate of growth roughly of the same magnitude as the growth of the economy—historically around 2 to 3% per year. On this basis, and starting with 407 million in 1960, production in 1965 would aggregate 455 to 485 million. To give some weight to the views of the optimists, the total could be significantly more.

Bituminous Markets

Oil and Gas Competition—The rate of natural-gas growth dropped off in 1960 compared to 1959, but the increase was still substantial as indicated by the accompanying table on sales (American Gas Association):

	Millions of Therms, 12 mo to:		
	9/30/60	9/30/59	% Change
Natural	89,795.9	83,820.5	+ 7.1
Mfr. & mixed	2,310.6	2,375.6	— 2.7
Total	92,106.5	86,196.1	+ 6.9
Res., com'l & other sales	45,352.5	41,244.6	+10 0
Industrial	46,754.0	44,951.5	+ 4.0

A fact of perhaps some significance was the relatively low increase in industrial sales. In the previous 12-mo period they had increased 11.1%, according to the American Gas Association.

The price battle, with owners on one side and pipeliners, distributors and consumers on the other, continued, with the government and the courts continuing to throw their weight behind keeping field prices down. Nevertheless, the average value of sales to consumers rose 7% in the first 6 mo of 1960 and the upward pressure continues.

Canada took its expected step of approving major exports of natural gas from the western provinces to the U.S. As a result, a major new pipeline flow to the Middle West began in November, 1960. More is expected to move into the U.S. in the years immediately ahead. The ultimate total can only be speculated about at this time.

One sign of a possible lessening of gas pressure—at least in one direction—is the decision of several electric utilities previously using gas to go to coal. Eventually, as indicated in the special study of coal and gas competition in the November, 1960, issue of *Coal Age*, pp 74-79, coal should be a major source of high-Btu gas.

Domestic demand for oil products was almost the same in 1960 as in 1959. Distillate fuel demand was up 3½%, but residual was slightly under 1959. Among other things, this reflected government control of importation, primarily to the Atlantic Seaboard, which cut the total for the year over 8 million bbl, equivalent to nearly 2 million tons of coal. Increased pressure by certain importers to knock out control was being resisted by the Eisenhower administration. What the new administration may do still is a question.

Overall, as indicated in the special study of coal and oil competition in the October, 1960, issue, pp 72-75, oil demand has slowed down and the pressure should become less and less in the future.

Electric Utilities—Record coal consumption was posted by the utility industry for the 12th consecutive year in 1960, though the recession held the increase down from what had been expected to an estimated 175 million, compared to 168,427,000 tons (bituminous and anthracite) in 1959. The gas burned by utilities probably rose some 8 to 10%, while oil use dropped 3 to 4%.

For the farther future, according to the 1959 *Keystone Coal Buyer's Manual* survey of utility fuel-burning plans, coal should mark up some gains in percentage of total—and of course will register higher and higher consumption totals. Switches to coal in areas previously considered gas and oil will contribute to the increase in coal's percentage of the burn. The Arizona Public Service Corp., for example, will use the output of two new mines, beginning in 1961, while New Mexico Public Service has established a subsidary charged with exploring the potentialities of future coal use.

Steel—Steel production dragged throughout the year and wound up 1960 with an estimated ingot total of 100 million tons. Coal consumption (for coke and for mill operation) was approximately 86 million tons, or about the same as in 1959.

The steel rate is expected to be less than 50% for the first half of 1961, and then is expected to start to rise, carrying coal consumption up with it. How much is still the big question.

Activity in the development of new char processes and in new types of beehive coke ovens continued at an increased level in 1960. One goal of charring is supplying the increased demand for carbon throughout the country. The rise in interest in beehive installations reflects, among other things, the high cost of conventional by-product units, the relatively unfavorable market position of the byproducts and the low cost and high quality of coke produced by the new beehive equipment. A substantial rebirth of coking at or near the mines in such equipment is foreseen by at least a few coal men and equipment manufacturers.

General Industrial—Coal burn in the market comprising railroads, cement mills, and "other manufacturing industries" dropped some 3½%, or about 3 million tons, in 1960, with railroads accounting for a big share of the decline. The relatively low percentage drop, compared to previous years, perhaps is explainable by an improved competitive position of coal in this field, compounded of rising competitive prices, better selling and servicing of coal, and the beginning of the installation of new-type coal-burning equipment. This latter includes the "Coal-Pak" packaged unit, the initial installations of which are fully living up to expectations.

Retail—In 1960 retail deliveries of coal were featured by a halt to the steady downward trend of several years standing. In fact, the results for the year confounded the forecasters in that there was no drop from 1959. In many other markets the forecasts of rises were derailed by increases or standoffs.

Electrical home heating registered another significant rise in 1960 in response to increased promotional pressure by an increased number of electrical utilities, assisted by the coal and allied industries. Accelerated growth is expected year-by-year in the future.

Exports—The continuance of the $4.67 per ton German tariff and not too much enthusiasm in administration circles for pushing for greater reciprocity by foreign countries were perhaps two of the major concerns of coal exporters in 1960. Canada, Mexico and overseas took about the same tonnages in 1960 as in 1959.

Since countries abroad are taking metallurgical coal almost completely, and since they have little chance of getting it elsewhere, the predominant view is that exports should maintain at least the present level for some years. In fact, improvement could be expected in view of the fact that it has been recommended in Canada that Nova Scotia steel plants import from the U.S., and the further fact that the German restrictions may well be modified if not completely removed in the relatively near future. The latter is not a certainty but the pressure is building up.

Industry Affairs

Further moves by the bituminous industry and by individual companies were directed at strengthening industrial and total positions. The National Coal Association reorganization for greater effectiveness on all fronts, including market promotion and research, was completed in 1960 and the association moved into its new Coal Building in Washington, D. C. (*Coal Age*, July, 1960, pp 116-119). The National Coal Policy Conference stepped up its operations and continued to gain ground in getting coal's views more accepted.

As the effects of the recession be-

came more evident, particularly in certain areas, such as southern West Virginia, eastern Kentucky and western Virginia, producing a large percentage of specialized and export coals, NCA, NCPC and other national and local organizations embarked on a program to assist federal and state agencies in stimulating production to the maximum extent possible, and in taking steps to provide other employment opportunities for a more-stable situation.

Diversification gained increasing consideration in 1960—not only in such moderate forms as char and coke production, as previously noted — but in the directions of chemical production. Thinking and planning for chemical facilities was particularly evident in anthracite. In bituminous, the North American Coal Corp. joined the group seeking diversification by announcing plans for the construction of a $1-million 40,000-tons-per-year plant for producing high-purity aluminum sulphate from coal-mine wastes.

Research

Two major developments in coal research in 1960 were:

1. Signing of the Coal Research Act, establishing an office of Coal Research in the Dept. of the Interior, July 7. The department planned to start off with $1 million and at the end of the year was pressing its efforts to get actual work underway.

2. Approval of a new $875,000 laboratory for Bituminous Coal Research, Inc., at Monroeville, Pa. It will handle general industry research and also specific contract jobs for producers and consumers.

Individual coal company research increased in 1960, with one of the major goals the production of better coal for metallurgical coke. A second for a number of companies was development of processes for char and chemical coke and by-products. Gas and liquid fuels were targets of some organizations—normally in cooperation with oil or gas companies and associations.

Transportation

The year 1960 was marked by the firm establishment of "incremental" and "contract" rates for volume tonnages of coal. These reflected the new determination of rail carriers to keep their coal traffic if at all possible. The ICC approved the incremental-rate principle adopted in 1959 for coal above certain tonnages to utilities on the eastern seaboard, and late in the year the Chesapeake & Ohio announced the first "contract" rate covering a guaranteed tonnage to a single customer.

The making of fine-coal and other special rates continued in 1960, and in some instances got the ton-mile charge for intrastate movement of coal by rail down to as low as 7 mills.

Water movement of coal continued to grow, and water carriers in 1960 began to mount a campaign against rail reductions, which were becoming of sufficient magnitude to give water real competition in some areas. The conflict, with its accompanying ICC and court cases, probably will intensify in the years immediately ahead.

The new rail approach to coal rates also was a factor in pipeline thinking. Additional gas-line operators were becoming interested in the idea of moving coal but at the end of the year there were no visible firm plans for the construction of additional lines, though there were significant advances in preparation of coal for pipelining. These led, among other conclusions, to the idea of a slurry that could be burned without dewatering. Research is said to have proved its practicability.

Labor

A quiet year is perhaps a thumbnail description of management-union relationships in 1960. One reason was the further strengthening of cooperation on matters of mutual concern. Another was the economic picture.

Governmental Relations

Though coal had not much luck in getting some of its ideas accepted by Congress and the administration, by the same token its efforts prevented the taking of additional action to its detriment.

Aside from individual actions or lack of actions, it was evident in 1960 that the improved machinery developed by the industry was paying off in a better reception for coal's ideas and proposals all along the line.

Public Relations

If this area, as well as in the area of relations with governmental and regulatory bodies, pollution—both water and air—moved more to the forefront in 1960. It was accompanied by increasing awareness of its responsibilities in this area by the industry, though those charged with representing coal in this area still felt that there was a long way still to go in this respect.

As an omen of things to come, Pennsylvania became more aggressive in the area of air pollution, while the Ohio River Valley Water Sanitation Commission adopted, on Jan. 14, 1960, "Resolution No. 5-60" (*Coal Age*, April, 1960, pp 80-84) stating that acid mine drainage could be controlled and setting out five procedures. Cooperative steps by the industry included action by the Coal Industry Advisory Committee to foster adoption of the resolution and conduct research to determine effective low-cost measures for solving the problem.

Merchandising

Merging of the activities of the American Coal Sales Association and the marketing division of National Coal into a new Marketing Dept. was a key action on the bituminous merchandising front in 1960. Divisions of the new department cover air pollution, manpower development, and market development. In addition the department supervises the operation of Bituminous Coal Equipment, Inc., formerly Automatic Solid Fuels Equipment.

Solid Fuels Equipment

The stepped-up efforts of these organizations, plus those of individual coal companies, undoubtedly kept the level of bituminous coal demand above what it otherwise would have been—perhaps by several million tons.

In anthracite, steps to improve its marketing apparatus included adoption of an equipment-rental program as a further means of creating interest and acceptance of hard coal by the larger apartment-house and similar users.

NEW MODELS of continuous-mining machines and improved conventional units led to higher production in thinner seams.

Mining, Stripping, Preparation in 1960

Highlights:

New mines come on stream

Equipment developments abound

Preparation designs stress central control

Deep Mining

ACCELERATION in the development of equipment for thin-seam deep mining that would lead to higher productivity was a trend much in evidence in 1960. In strip mining, long strides were taken during the year in the further refinement of AN blasting techniques and development of overburden drills and stripping machines of even higher capacity than the giants already in service.

Research and development in coal preparation were actively pursued, including the introduction and practicable plant-control systems based upon gamma-ray radiation devices. In the main, 1960 was an active year insofar as equipment developments and applications are concerned. Major events of this nature occurring during the year just closed are as follows:

A number of new deep mines made industry headlines in 1960, some in ground-breaking stages of development and others building up their production to design targets. These new properties straddle the major coal fields, from Warrior field in Alabama to Franklin County in Illinois, and in northern West Virginia, western Pennsylvania and Indiana.

The favored method of extraction at the new mines is with continuous-mining systems, although three of the biggest are relying on new, high-capacity conventional equipment. All are AC-powered, which points up the fact that the move toward AC power at the face is no longer a trend but

BETTER VEHICLES and new differential-rate belt feeders eliminated bottlenecks in face transportation.

GREATER machine flexibility and improved rock breaking highlighted stripping.

is an established practice in designing new mines.

Highlights of the year in various phases of deep mining include the following:

Mining Methods

The spreading use of shortwall-type continuous-mining machines marked activities in thin-seam mining in 1960. Accompanying this development were innovations in conveyor systems to serve these units and refinements in face methods. Thin-seam mining received a great deal of industrial-engineering attention.

One operator using a shortwall miner loading to conveyors reports a 150% increase in productivity over hand loading onto conveyors in room work. The productivity increase in development work is 94% in favor of the continuous method (see *Coal Age*, February, 1960, p 98).

A West Virginia mine, in coal that averages 34 in in thickness, uses a boring-type continuous machine discharging onto conveyors. Average production for a 5½-man crew was reported as 472 tons per shift—with peaks of over 700 tons per shift. Delays in this system included 15% of face time for panning up, a loss which the operators feel will be substantially reduced through the introduction of available conveyor systems which promise more-continuous transportation.

Conventional units for thin seams were not neglected in the equipment development plans of manufacturers. High-capacity drills, loading machines, cutting machines, shuttle cars and roof drills were announced, and shown at industry exhibits. These units, featuring labor economy and high output, are made for seams as thin as 28 in. Added to these forward steps are the benefits to be realized from recently-developed systems for multiple-hole coal-breaking using compressed air.

Similar interest and energy were evident in the development and application of equipment, continuous and conventional, for thicker seams. Included in this list is a shuttle car, announced late in the year, that has no clutches nor torque converters. Two-speed operation (2½ or 5 mph) is made possible through the use of double wound motors. The basic car is 44 in high and carries 10 tons.

Also late in the year reports began to come through on the field construction of equipment for a "push-button" mining project in Kentucky and continuation of the experimental work relating to hydraulic mining of coal, both anthracite and bituminous. The high-pressure monitor which supplies the coal-cutting water now has been mounted on a conventional loading machine to provide greater mobility in the system.

Renewed interest in longwalling led to the introduction in a Pennsylvania mine of a system employing a coal planer and hydraulically-powered, self-advancing roof supports.

Roof Control

Over 2 yr of actual experience with yieldable roof jacks at a Pennsylvania mine establishes the superiority of these jacks over cribs in "open end" support during pillar recovery. The time of exposure of timber men to roof hazards in setting and recovering such support is dramatically reduced when the yielding jacks are used. They are strong, transportable and safe.

Studies were conducted throughout the year by the Bureau of Mines into the feasibility of using sonic techniques to explore the nature of mine roof. Sonic generators have been built for the purpose, and test results to date indicate that unconformities and inconsistencies in the roof can be detected to a depth of perhaps 5 ft. The tests continue.

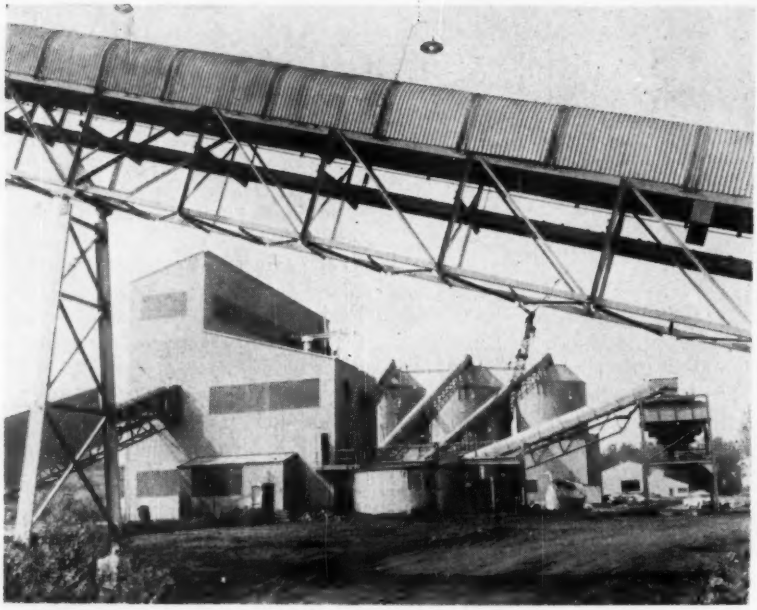
Other mines were testing the values of advancing face shields to protect operators of mining machines at the immediate face. Several possible designs have been advanced.

Ventilation

Ventilation became a severe problem to a company mining a 20-ft-thick seam in Virginia. Delays of an hour or more were often encountered as a result of methane concentrations in working places and the difficulties of removing these concentrations. The problem finally was solved by using a 30-in tubing across a set of five development headings with 18-in laterals extending from the 30-in main to the faces of the headings. A blower fan supplies air through the main and laterals to the faces in a quantity of 5,000 cfm per face.

This setup is advanced at intervals of 160 ft. Check curtains outby the 30-in main and permanent stoppings in breakthroughs control the flow of air to the fan to prevent recirculation.

In mid-1960 top-flight ventilation experts in reports to industry meetings nailed down another elusive factor in the technology of employing bleeder entries to ensure a supply of fresh air along pillar lines. The advice they submit is that extra power must be installed at the fan



STORAGE FACILITIES, more precise preparation and better plant controls contributed to maximum product enhancement and uniform plant performance.

to provide a pressure differential at remote pillar lines that will cause air to flow in a controllable manner. Too often this facet of the ventilation design is neglected.

Transportation

Differential-rate belt feeders became big news in 1960. Several types were offered which receive the full-rate discharge of shuttle cars and meter the coal onto belt conveyors at reduced rates. The immediate result where such units have been introduced is a boost in overall efficiency because of the increased number of payloads per car per shift.

A boon to track-haulage mines is the recent development of a faster rail-welding technique in which no preheating of the joint is required. As explained on p 94 of the August, 1960, issue of *Coal Age*, the time required to make a welded joint is greatly reduced, in the magnitude of 80%.

Solid-carcass belting attracted a great deal of attention, and first operating reports on the 6-wheel, hinged-at-the-center shuttle car were released (*Coal Age*, September, 1960, p 102).

Safety

Design and erection of permanent barricades to be used as emergency havens and the formulation of detailed plans to be followed in escaping from stricken sections or in barricading were steps taken by a number of companies in their efforts to reduce the toll of lives claimed by mine fires, explosions and the aftermath. Research on the foam-plug method of extinguishing fires continues, and a commercial system now is on the market.

Efforts to improve the working environment for men drilling bolt holes in rock led to the full development of dust-collecting systems which confine the harmful dust within the drill rod on its way to the collecting tank.

Also in the news in 1960 was the fruition of the program aimed at developing fire-resistant hydraulic fluids. Most major oil companies supplying the coal industry had approved emulsions on the market. For a full operating report see *Coal Age*, September, 1960, p 128.

Services

Bulk- and package-handling of mine supplies is the coming thing. A good start already has been made in the handling and application of rock dust using low-pressure air to fluidize the rock dust. This development is described in the August issue of *Coal Age*, beginning on p 104.

New gains were marked up for AC power underground and manufacturers were active in developing improved distribution equipment for underground applications, including trailing-cable protective devices. Fully-automatic skip hoisting was installed at a number of mines, some new systems, some conversions of existing equipment.

The increased stature of the maintenance function came more sharply into focus in 1960. In some cases the head of the maintenance department and the production chief report with equal status to the top operating manager. The need for maintenance training to greater depth is more widely recognized. More mines are setting up definite overhaul schedules on key machines.

In brief, 1960 in maintenance will be remembered as the year the switch to fire-resistant hydraulic fluids began in earnest. It was also the year in which synthetic lubricants began to move forward.

Stripping

BIGGER AND BETTER stripping machines, revolutionary design changes in overburden drills, improvements in blasting materials and techniques, and refinements in haulage set the tempo in stripping during 1960.

The most exciting news in stripping in 1960 was the announcement that a 115-yd shovel is being built for a new mine in western Kentucky. It will move 3 million cu yd of overburden per month and expose 14,000 tpd of coal. Other exciting happenings during the year were revolutionary design changes in smaller stripping machines and rotary dry-type overburden drills. A new premixed non-cap-sensitive blasting agent that works effectively in holes as small as 2 in came on the market to widen the range of explosives selection. And blasting safety received a big lift with announcement of a new ammonium nitrate initiator that is said to be safer, surer and more economical than high explosives. More operators relied on explosives alone to move overburden into the pit.

Draglines continued as favorites for handling overburden in hilly terrain and in the pitching anthracite deposits. Another wheel excavator went into service to supplement a

large shovel and dragline, thus doubling mine capacity. In haulage the trend continued toward the large trailer truck, with the 80-ton unit in service and the 100-ton hauler remaining as a future possibility.

Breaking Overburden

Two important advances in drill design were recorded in 1960 with delivery of the first twin-head rotary dry-type sidewall unit and announcement of a vertical rotary dry-type machine whose mast can be tilted 30 deg from vertical. Both drills are on fully revolving frames.

The twin-head sidewall machine can drill simultaneously two holes up to 12-in in diameter to a depth of 90 ft. Drill masts are independently controlled and can be tilted up or down. Maximum operator safety and comfort are provided by an air-conditioned cab with bulletproof glass and a protective steel framework facing the highwall (see p 78).

The vertical machine also has pushbutton control of drilling functions from an air-conditioned cab. An overhead drive can be adjusted to drilling conditions by turning a knob. Its revolving frame is independent of crawler action.

Effective use of a blasting chart at an Ohio operation results in controlled overburden breaking and better fragmentation with less blasting agent. A new 12-yd dragline with a 165-ft boom enables the company to dig deeper and improve over-all efficiency. A large bulldozer removes up to 30 ft of loose material in making a working bench for the dragline (*Coal Age*, January, 1960, p 83).

Two Alabama operators use 150-grain detonating fuse as a primer for the full length of the nitrate-oil charge. When water is encountered in drillholes, cartridges with built-in primers are used. A large portion of the overburden is thrown into the pit with explosives alone. Big bulldozers remove 40 to 50% of the broken overburden and a 4½-yd shovel removes the remainder. Self-moving augers supplement stripping production. Straight posts in the mouths of auger holes warn auger workers of any highwall subsidence (*Coal Age*, March, 1960, p 74).

A Kentucky operator relies on both horizontal and vertical drilling to meet varying conditions. A company-designed horizontal auger and a load-tamp machine make it possible to prepare sufficient overburden for 24-hr operation by a 33-yd shovel. Holes are drilled 80 ft deep on centers varying from 18 to 30 ft and charged with 50-lb cartridges of 5x40-in explosive and 5% primer. In a second pit, a vertical dry-type machine bores holes on 20-ft centers in rows 24-ft apart. These holes are charged with nitrate-oil mixture prepacked in 8-in burlap bags lined with plastic.

A 2- to 6-ft layer of limestone separating the two coal seams is drilled with a special company-built unit fitted with four drills on one arm. To enable auxiliary shovels to work effectively in the two-seam operation, the company lengthened the dipper handles and booms and elevated the operators' cabs to the roof of the housings (*Coal Age*, October, 1960, p 76).

Removing Overburden

Long-range planning of pit operations and close supervision of day-to-day problems at a Kentucky pit provide the basis for successful stripping in watersoaked areas near stream level. The initial cut was made along the edge of the property where the seam elevation is lowest to provide a sump for all pit inflow. Spoil from this area furnished material for a dike between the pit and a nearby stream. A 16-yd dragline with a 165-ft boom removes 6 ft of water soaked material to provide a firm footing for the next cut while it uncovers a 100-ft-wide strip of coal (*Coal Age*, February, 1960, p 128).

Incorporating new design concepts, a new diesel-powered shovel with two engines makes possible faster stripping cycles with less operator fatigue. Greatly reduced maintenance is an added benefit at this Ohio operation. One engine powers the swing, travel and hoist booms; the second powers the drums. The new shovel operates in a 3-step cycle employing a bulldozer to remove the top 12 ft of cover. It removes a layer of shale down to a limestone layer and then piles the limestone at the toe of the spoil so it can be buried in the next pass. (*Coal Age*, July, 1960, p 96).

Versatility and flexibility in pit operations, made possible by teaming big bulldozers and two draglines lead to profitable thin-seam stripping in Ohio. Overburden is broken with ammonium nitrate-oil mixture primed with 60% dynamite. Draglines employ variations of the key-cut system to remove shale overburden (*Coal Age*, August, 1960, p88).

Services

Magnetic testing of parts adds safety, economy and efficiency to an Indiana operation. The company tests all new equipment before it goes into service and periodically checks parts on machines while they are in the shop for overhaul and repair. Flaws are detected before a breakdown occurs, thus eliminating costly downtime or injury to personnel (*Coal Age*, August, 1960, p 120).

Small shop-made multiple-level working platforms provide a safe, nonskid footing for mechanics repairing big coal haulers in Illinois. With the aid of a platform a mechanic can work on an engine without crawling over wet, slippery tires or bumpers. As a result, he is able to complete a job faster and safer.

At another mine a radio-equipped panel truck carrying assorted frequently needed small parts and extra tools helps speed minor repairs. A roving mechanic, based at the main garage, uses the truck to speed to the pit when alerted by radio from one of the stripping units. He can be on his way in a matter of seconds without losing valuable time to load parts and tools. It also carries a sparkplug-type compressor attachment for filling tires in the field (*Coal Age*, September, 1960, p 140).

A shop-made portable magnet helps reduce tire damage by picking up nails, bolts, ends of welding rods or other metal which frequently drop on pit roads. Wheel-mounted on a steel frame, the magnet measures 18x48 in and is towed by a farm-type tractor.

Changing big, heavy tires on coal haulers is a one-man job requiring a minimum of physical effort with the aid of a shop-built dolly used at an Illinois mine. It formerly took two or three men to do the same job and required much more physical effort. Mounted on four casters, the dolly has a rack and chain for securing either single or dual tires.

Pieces of old dragline chain attached to the bumpers of semitrailers serve as tow chains and prevent damage to the trucks at this same

company. Each coal hauler also has a husky hook on the front bumper so that it can be connected to the chain of another truck and towed to the shop in event of a breakdown (*Coal Age*, October, 1960, p 126).

Preparation

UPGRADING coal to the best possible quality, boosting over-all clean-coal recovery, more centralized plant controls, more storage facilities and increased emphasis on water clarification were major preparation goals in 1960.

In coarse-coal preparation heavy-medium washers again led the field, with jigs and calcium chloride washers also registering gains. Upward current classifiers continued as important preparation units in anthracite. In fine-coal preparation, wet tabling with double-deck units made further gains and recovery of ultrafines received continuing emphasis as more froth flotation cells went into service. The first heavy-medium cyclones for washing fines went into service and lived up to expectations. To meet the challenge of water clarification, more companies added cyclones, thickeners and filters. The use of flocculants become more popular as an aid in speeding settling of ultrafine solids.

More nuclear gravity controls for heavy-medium washers were added to provide more precise control over washer performance. And more raw- and clean-coal storage facilities were built to improve plant flexibility.

Upgrading Quality

A West Virginia company enhanced its market position by improving product quality with fine-coal cleaning facilities and emphasizing its metallurgical product. The company uses a concrete pond with baffles for low-cost water clarification (*Coal Age*, January, 1960, p 92).

In planning a new preparation plant, a western Kentucky operator selected equipment that would meet its future needs when a second seam of coal is tapped. Major plant features are two-stage jig washing, centrifugal drying and oil treating. Efficient car handling, including weighing, by only two men, was made possible with the aid of a ballasted truck tractor and endless-rope hoists (*Coal Age*, February, 1960, p 128).

A low-cost oil spraying system developed by the above plant coats the interior of railroad cars with oil and thus prevents the coal from freezing to the sides as it travels to the customer. The system has one rotating and two stationary sprays whose position in the car is controlled by the boom operator (*Coal Age*, February, 1960, p 152).

The long walk back from the clean coal yard is a thing of the past at an Ohio mine. Now the men ride back on an automatic electric locomotive. The automatic unit travels back to the loaded track by itself after carrying the men back to the plant (*Coal Age*, March, 1960, p 134).

A West Virginia producer relies on jig washing, mechanical dewatering and thermal drying to produce a high quality utility, industrial and metallurgical product. Cyclones are combined with a filter to remove fine solids from the circuit (*Coal Age*, March, 1960, p 70).

A continuing program of plant improvements enables a West Virginia company to keep pace with the changing market picture. Major equipment includes a heavy-medium washer, wet tables, cyclones, mechanical and thermal dryers and filters (*Coal Age*, June, 1960, p 80).

Innovations in plant design plus application of special steels that withstand abrasion and corrosion while improving coal flow are features of a new Pennsylvania plant. Among the innovations are architectural lines that please the eye and blend nicely into the nearby community; use of tubular steel prefabricated conveyor galleries; soundproofing of the plant with special vinyl painted steel sheathing and fiber glass; and pipeline transportation of fine refuse 3½ mi. Preparation equipment includes sand flotation cones, wet tables, flotation cells, mechanical dryers, thickeners and vacuum filters (*Coal Age*, June, 1960, p 94).

Pinpoint accuracy in maintaining the operating gravity of a heavy-medium system is the main feature of a modernized anthracite preparation plant. An automatic nuclear control maintains the gravity of the bath within a range of ± 0.003 (*Coal Age*, July, 1960, p 87).

The first plant in Illinois designed specifically to serve the metallurgical market of the Midwest began operating in 1960. The plant features jig washing of 6x¼, air cleaning of ¼x0, centrifugal drying and automatic proportioning blending facilities (*Coal Age*, July, 1960, p 100).

Dripper chutes under belt conveyors simplify cleanup at a Pennsylvania plant by preventing spillage of fines. These chutes catch material that clings to the carrying side of the belt after it passes over the head pulley but drops off on the return run to the tail pulley (*Coal Age*, August, 1960, p 122).

Freezproofing to prevent coal from freezing and sticking to the sides of the car is now done by pushbutton at a Kentucky mine. To spread a uniform coating of oil onto the interior of railroad cars the loading point operator pushes a button on his control board (*Coal Age*, September, 1960, p 138).

Replacing conventional elbows with T-shaped connectors in pipelines carrying fine coal to tables helped reduce maintenance costs at a Pennsylvania plant. Solids build up in the lower closed part of the fittings and prevent abrasive action (*Coal Age*, September, 1960, p 140).

Better preparation has opened the door to metallurgical markets for an Illinois operator while solidifying its position in domestic and industrial markets. A heavy-medium washer recovers metallurgical coal, air tables and a jig clean fines and middlings. Raw- and clean-coal storage facilities add to plant flexibility (*Coal Age*, November, 1960, p 80).

Keeping the steel tire of rotary breaker free of waves or irregularities is achieved with a built-in grinder in service at an Illinois plant. The device consists of a series of rubbing stones that float up and down in a curved support over the breaker tire (*Coal Age*, November, 1960, p 140).

Portable racks provide orderly storage of spare screen cloth at the same mine. Each rack is mounted on four wheels and has a numbered identification board that lists the screens it holds. Each screen also has an identification tag (*Coal Age*, November, 1960, p 140).

A new Illinois on-river plant features total washing with heavy-medium and hydrotator units, centrifugal drying, raw- and clean-coal storage and direct loading into barges (*Coal Age*, December, 1960, p 70).

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You reduce costs because the durable Westfalia Coal Planer lowers maintenance and repair expenses, requires no other roof supports or bolting and is operated by a minimum crew. You eliminate cutting, drilling, explosives and all other loading equipment.

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The Westfalia System, first brought to this country through the cooperation of the U.S. Bureau of Mines and a coal producing company, has proved itself in several hundred installations in all important coal mining areas of the world. Results soon will be available from the latest installation in West Virginia.

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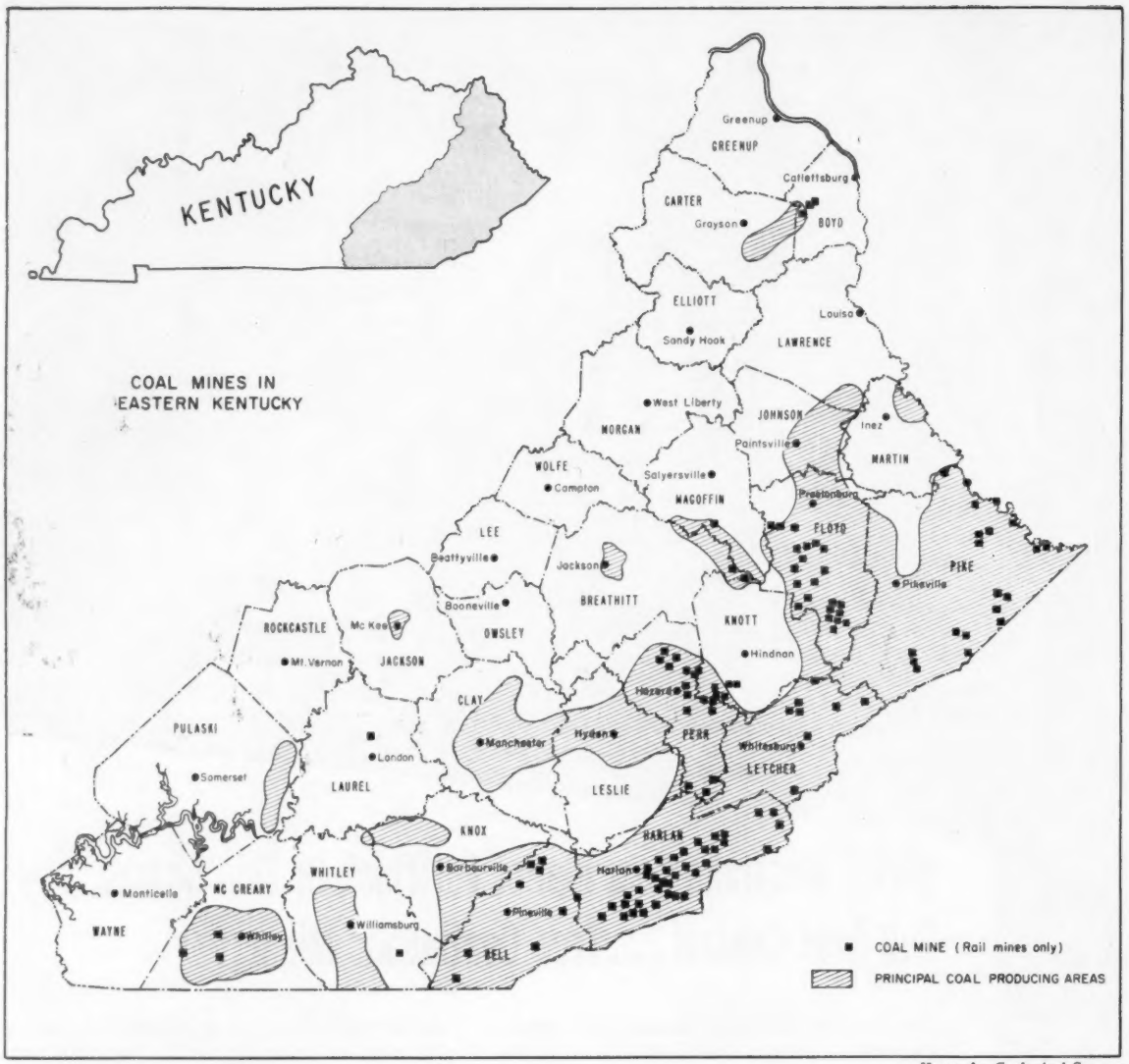


Kentucky Geological Survey

Eastern Kentucky in Dist. 8

KENTUCKY RANKS THIRD in the production of bituminous coal in the U. S. The output for 1958 (latest figures) was 66,311,805 tons (USBM MMS 2974). The eastern field—a part of Dist. 8—is in the Appalachian region and contributed approximately 58.2% of the state's total production.

It comprises 30 counties which produced better than 39½ million tons in 1958. Of this total 2,473 underground truck mines employing 17,966 men produced about 13½ million tons. Some 145 strip and auger truck mines employing 1,118 men produced about 2½ million tons.

Employing 12,362 men, 128 underground rail mines—those served by railroads—produced slightly more than 22 million tons. Twenty-four rail-connected auger and strip mines produced better than 1 million tons with a working force of 439 men (Kentucky Dept. of Mines & Minerals).

The small underground truck mine accounted for 34.3% of eastern Kentucky's production, 89% of the number of mines and 56.2% of mine employment. These figures point up the fact that truck mining is big business and that it plays an important role in the economic structure of eastern Kentucky.

Topography of the eastern field is mountainous and many of the coal seams outcrop on the sides of valleys. Seam conditions and location, distance from railroad facilities and problems of purchasing or leasing coal properties are factors which have influenced the growth of small truck mines in this area. Height of mineable seams, ranging from 28 to 40 in, governs, in many cases, the type of equipment used and the basic method of mining the coal.

Although equipment and mining methods may vary, most truck mines and a number of rail operations have chosen, out of necessity, special equipment to meet mining conditions. Methods of mining also have been modified to meet equipment and seam requirements. Mining men and manufacturers are continuously developing more efficient equipment for low seams.

LEONARD YOUNCE, owner and operator, Daniel's Branch Coal Co., discusses mine problems with Ernest Sumpter, mine foreman. Mine has been operating 2 yr.

HERMAN COLLIER, owner and operator of the Herman Collier Coal Co.

Deep Mining Thin-Seam Coal In Eastern Kentucky

Equipment and mining methods at two truck mines are typical of the 2,473 small underground truck mines as well as a number of rail operations in eastern Kentucky's Dist. 8.

INITIAL LOW COST, ability to operate in low seams, and low operating and maintenance costs are outstanding features of the small low-vein rubber-tired tractors and trailers used by many truck and rail operations in eastern Kentucky. This equipment is an important factor in producing coal economically in low seams and under tough mining conditions. Typical operations are the Daniel's Branch Coal Co., and Herman Collier Coal Co., Whitesburg, Ky.

Both companies are mining the Hazard No. 4 seam, which averages 40 in in height. The Daniel's Branch mine has been in operation 2 yr with a life expectancy of 10 yr on the present lease. Additional property adjoining the mine will be leased, extending property life to approximately 40 yr at the present rate of production.

Leonard Younce, owner and operator, has been associated with the mining industry in Kentucky most of his life. Prior to the installation of the Daniel's Branch mine, which uses battery-powered rubber-tired tractors and trailers for section and mainline haulage, he had favored track haulage. After 2 yr of experience with the present haulage system he states that his views have changed because, "This equipment works better for our type of mining than any other I have tried. Low initial investment, minimum maintenance cost, sufficient capacity and flexibility have sold me on this equipment."

Herman Collier Coal Co. operations include a tractor-trailer mining setup and, at another location, a track-haulage setup. "Operating costs," states Mr. Collier, "are much higher at the mine using track haulage than they are at the tractor-trailer operation."

Production Units

One section of equipment, normally, accounts for the entire output at a mine, depending on mining conditions and the size of the mine and property. Additional sections can be added when the mine is developed to the point where one section will not interfere with the operation of others and also when more tonnage is required. The section lineup at the two companies is as follows:

12 BU Joy loader.

512 Goodman machine equipped with a 9-ft bar.

T-2 Joy machine truck.

744N Kersey battery-powered tractors.

Model 75 Kersey rubber-tired tandem coal cars.

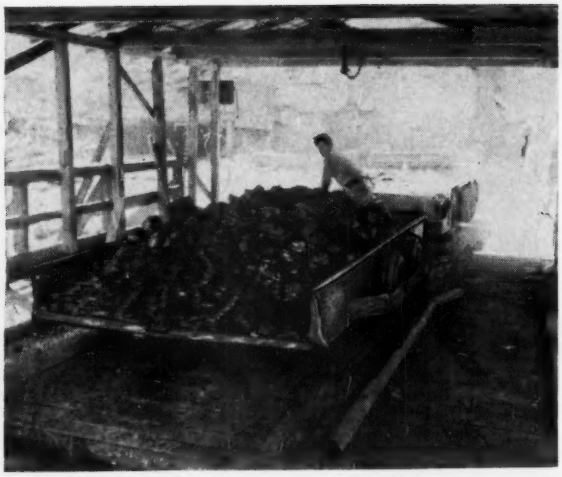
RBD 30 Chicago Pneumatic roof bolter.

570 Chicago Pneumatic coal drill.

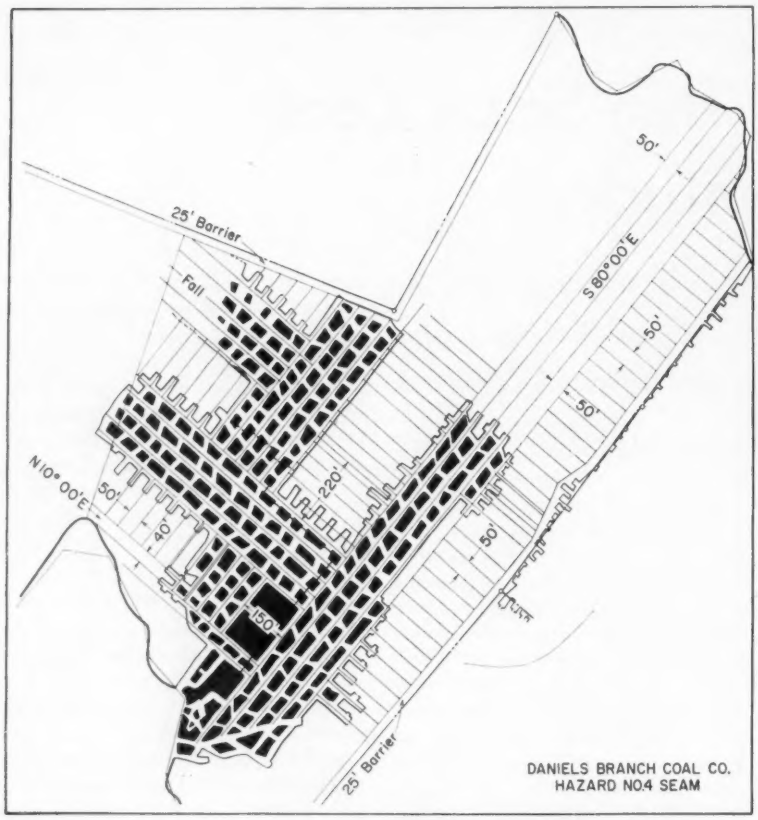
The Daniel's Branch mine uses four tractors and eight tandem coal cars to haul coal from the section to the outside, whereas the Herman Collier mine uses three tractors and six tandem coal cars.

Tractor Features—The heavy-duty four-wheel-drive four-wheel-steer tractors are equipped with Goodyear hydraulic disc brakes. These tractors are designed for large-tonnage mines with long hauls. Under normal conditions a tractor will pull five Model 75

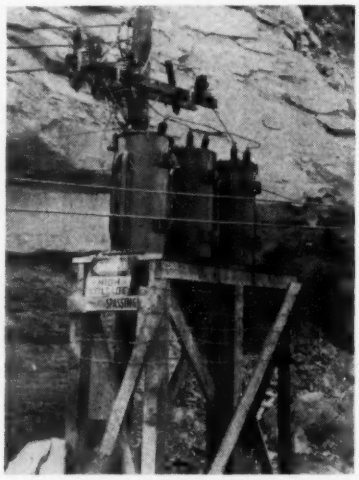
AC MACHINE loads 3½-ton trailers in 2½ min. Loader has been operating 2 yr without a motor failure.



LOADED TANDEM COAL CAR is pushed onto dump by tractor and then end-dumped. Haulage unit returns to section.



MAP shows mine projection on right side of property. A new opening will be installed on the opposite side of the valley from the present portal to reduce haulage distance, keep transmission lines short and minimize ventilation problems.



INCOMING VOLTAGE is reduced from 6,900 to 220 V for mine distribution.

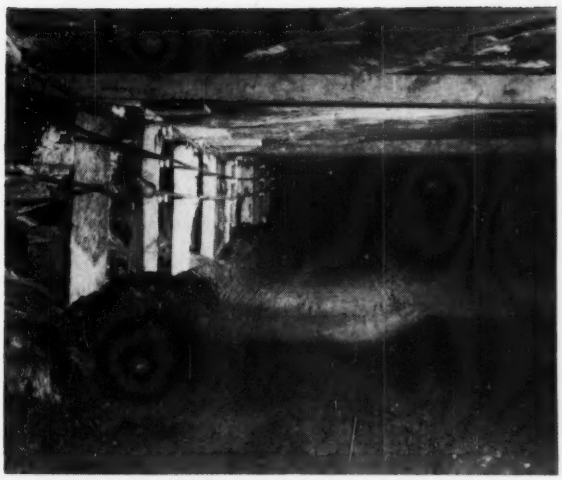
3½-ton tandem coal cars per trip. Starting drawbar pull is 5,250 lb.

The front and rear axle assemblies are mounted on coil springs for better traction and to reduce operator fatigue. The differential ratio is 5.87:1 and is rated at 6,000 lb per axle. Front and rear differentials are equipped with power-lock to prevent traction loss. When one wheel slips, the differential locks to permit both wheels to pull.

A 48-cell motive-power Exide battery with a capacity of 21.6 kwh provides power for the tractor. A two-speed magnetic-contactor control, with interlock to prevent plugging, provides speeds—forward and reverse—of 3 and 6 mph.

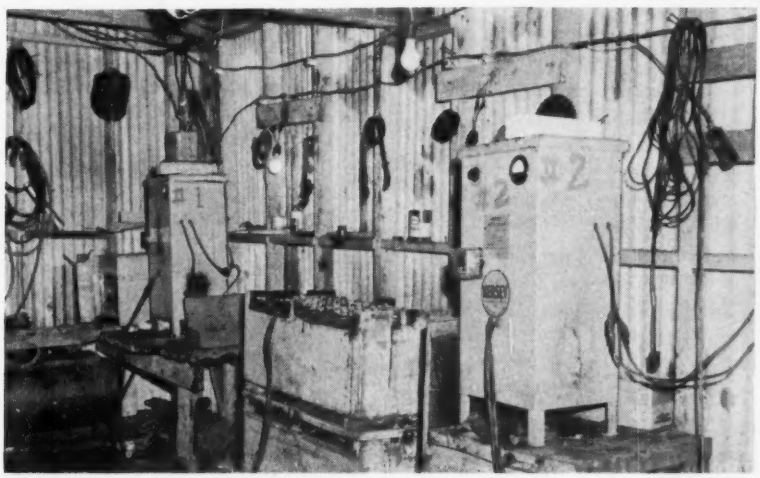
One standard 10-hp series-wound motor supplies the necessary horsepower. The motor drives a Kersey Model 710 reducer which is designed to withstand overloads of up to 300%. Motors are glass insulated.

Coal-Car Design—The Model 75 end-dump tandem coal car is constructed of ¼-in machine-stamped steel plate. The trailer is 21 in high, 88 in wide and 12 ft long. It is equipped with four 6.00x9 8-ply pneumatic tires on solid puncture-



HAULAGE ROADS are kept in good condition to avoid slowdown in haulage cycle. Note line timbers and AC power cables.

CLEARING on opposite side of valley will be the site of the second portal. It will reduce haulage distance.



BATTERY RECHARGING STATION is equipped with automatic rechargers and spare batteries. One man takes care of batteries and attends to other outside duties.

VOLTAGE BOOSTER for 220-V system increases voltage as much as 32%.

proof tires. Coal car capacities are 2 and 3½ tons.

Mining Practice

The five-heading system is used in main entries and panels. Headings are driven to the property line or outcrop on 50-ft centers 18 to 20 ft wide. Rooms are driven approximately 350 ft deep on 40-ft centers and up to 35 ft wide. This plan permits 85% to 90% recovery.

Roof conditions are fair. Top consists of slate and sandstone, and the bottom of jackrock. Roof is supported with 30-in bolts and timbers. Cross bars are used when necessary. The roof-support plan requures that timbers and bolts be set on 4-ft centers. Line timbers in haulage ways are set so that tractors have a 12-ft roadway.

After places are timbered and roof-bolted, the machine crew moves in and cuts, drills and shoots the coal. The machine is moved to the next place with the T-2 truck.

The machine crew drills four holes 4 ft apart near the roof. Each hole is charged with two sticks of du Pont Lump Coal CC. A Femco blasting battery is used to detonate two charges simultaneously.

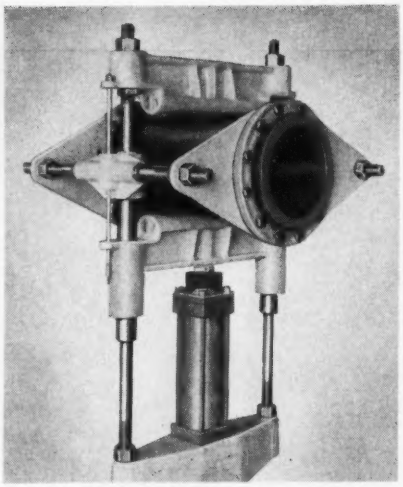
Coal is loaded into the 3½-ton tandem coal car by the 12 BU loaders. Cars are loaded at a rate of approximately one every 2½ min.

On short hauls—up to 1,500 ft—each tractor pulls one car. Tractors pull from the loader, haul to the outside, unload and return to the section.

As haulage distance increases — 1,500 to 3,000 ft—each tractor will pull two or more tandem coal cars. Normally one trailer is added for every 500 to 1,000 ft of advance. An alternate system includes keeping one or two tractors at the face to distribute empties and gather loads. Loads are then picked up by another team of tractors working separately or in tandem. These tractors haul to the outside, end-dump the cars and return the empties to the pickup station. Tractors can handle four or five cars, depending on haulage conditions.

On a 3,000-ft haul tractors can make a round trip in approximately 20 min. Haulage time decreases in proportion to the distance. If the haulage distance, for example, is

AUTOMATED *Hydral-60* PINCH VALVE SYSTEMS



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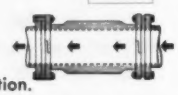
- The Massco-Grigsby Hydral-60 System consists of one or more pinch valves with a single automatically operated hydraulic pump.
- Hydraulic pump may be operated by electric motor or by air from normal plant supply system.
- Valves may be the same or different size.
- Valves in the system may be operated simultaneously or independently.
- Control valve may be manual or solenoid.
- Valves are self-supporting and may be operated in any position from horizontal to vertical.
- Valves may be coordinated and interlocked with other plant equipment to automatically control tank levels, rate of flow, etc.
- Valves may be independently controlled for normal or rapid closure.
- Valves may be held fully open, fully closed, or at intermediate positions.
- Remote control to meet individual requirements.
- Controls may be included for automatic emergency operation.
- 3" to 14" I.D. sizes, with 50, 100, and 150 psi line pressure ratings.
- Temperatures to 200° F.

Advantages of Massco-Grigsby Pinch Valves

- Rubber, neoprene and special compounded rubber sleeves *for corrosive and abrasive pulps and liquids.*
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Unobstructed flow eliminates high friction loss and prevents contamination.



- Split flanges and patented Flex Seal ends assure perfect seal.
- Rugged, heavy duty construction for most severe service and long life.
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1,500 ft the round trip will take about 10 min.

Coal is stored in a 180-ton bin. The unloading ramp is located at seam level and near the mine opening.

The entire production from both mines is sold to the Jim Elkhorn Coal Co. Two 17-ton GMC trucks haul coal approximately 5 mi to a ramp where coal is weighed, unloaded and cleaned in a modern preparation plant.

Production Crew—The production crew at these two mines, including outside personnel, consists of 12 men, plus foreman, as follows:

Loader operator and helper.
Cutter operator and helper.
Shotfirer.
Four tractor operators.
Roof-bolter and timberman.
Repairman.

With a balanced work cycle, strict adherence to the mining plan and proper use of equipment, the crew produces an average of 285 tpd.

Auxiliary Equipment—AC power is delivered to the mine by the power company at 6,900 V. Three 50-kva transformers (coal-company owned) reduce the voltage to 220 for mine distribution and surface installations. Power is distributed underground by three insulated 4/0 cables. The power company charge for establishing service was $10,000.

Power boosters, manufactured by the Electric Motor & Repair Co., Raleigh, N. C., provide a 32% boost in face voltage as distance from the main power station increases.

Exide batteries and Kersey battery chargers team up to provide a continuous source of DC haulage power. All other equipment is powered by AC.

A 48-in propeller fan equipped with a 3-phase 7½-hp motor ventilates the Daniel's Branch mine. A minimum of 11,500 cfm of air is maintained in the last break. Brattices are constructed of 4-in concrete blocks.

Seam conditions and locations, distance from railroads facilities and problems of purchasing or leasing coal properties are factors which have influenced the growth of small truck mines. Determination and ingenuity on the part of mine owners and manufacturers have made the truck mine economically profitable.

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rubber bumper

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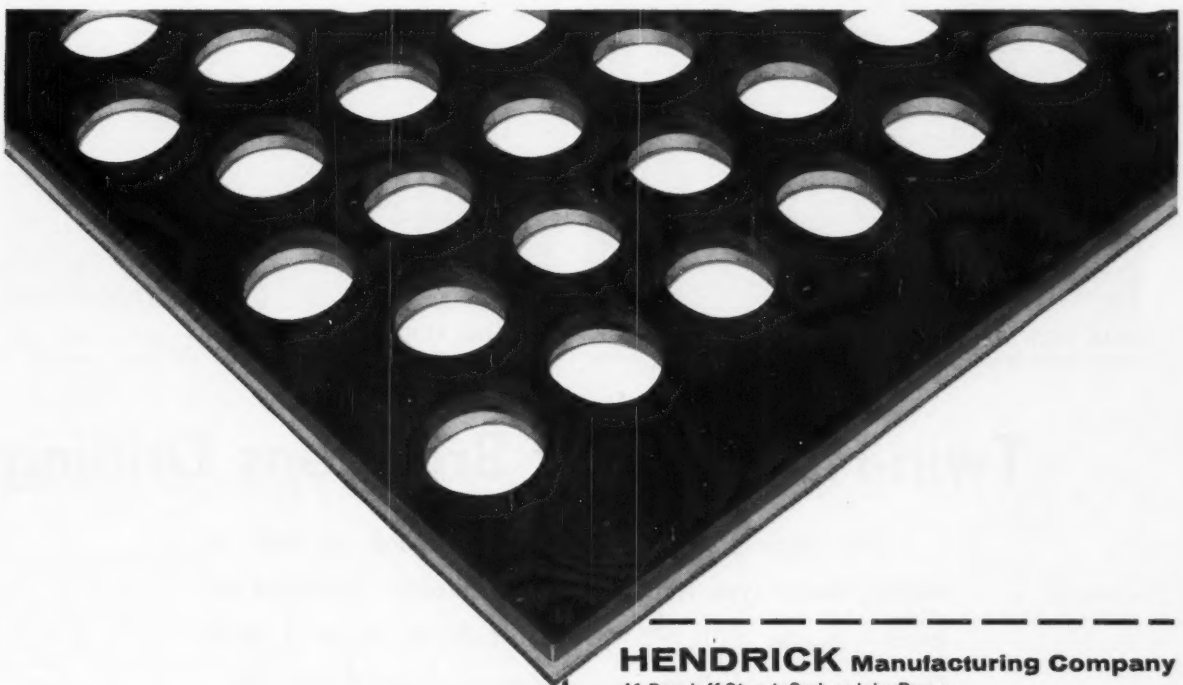

HENDRICK Manufacturing Company
41 Dundaff Street, Carbondale, Penna.

Gentlemen: I would like to learn more about Hendrick Rubber Clad Perforated Metal Screens.

☐ Please have representative call.
☐ Please send FREE literature.

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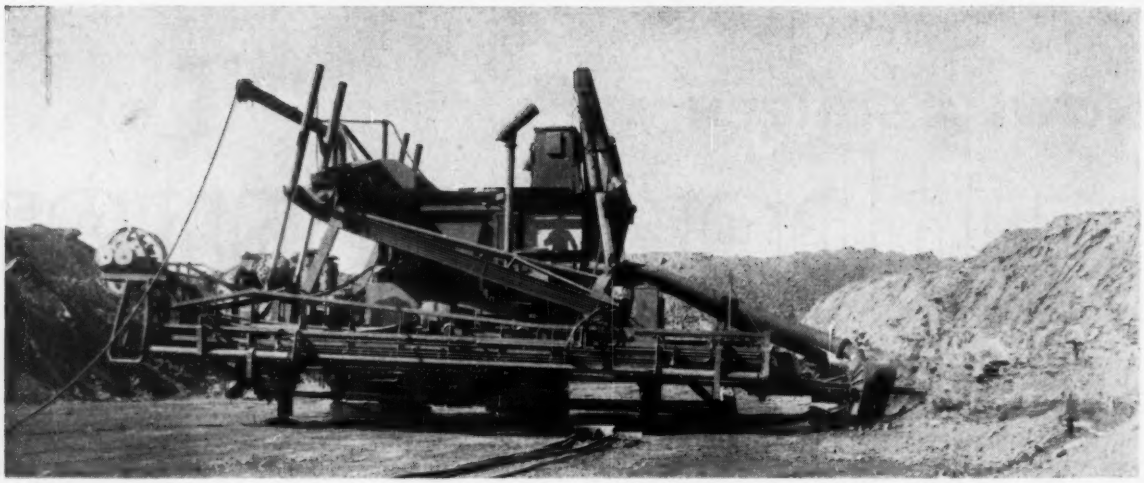
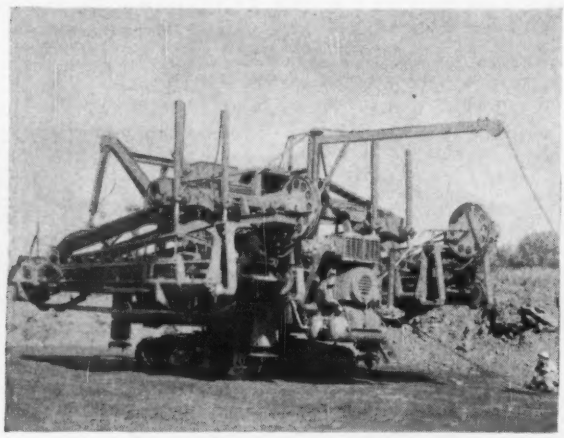


TWIN-HEAD HORIZONTAL DRILL bores two holes simultaneously on 22-ft centers in shale overburden. Drill masts are independently positioned and operated from air conditioned cab. Each mast holds three 30-ft drill pipes.



REAR VIEW shows reels for air and power lines at ends of masts. Main power cable is supported by free-swing boom.

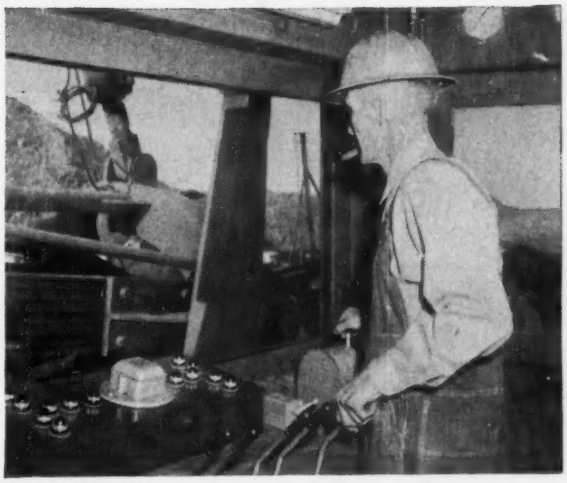
DRILLING FLEXIBILITY is illustrated by hydraulically positioned masts tilted to maximum up and down positions.

Twin-Head Giant Broadens Drilling

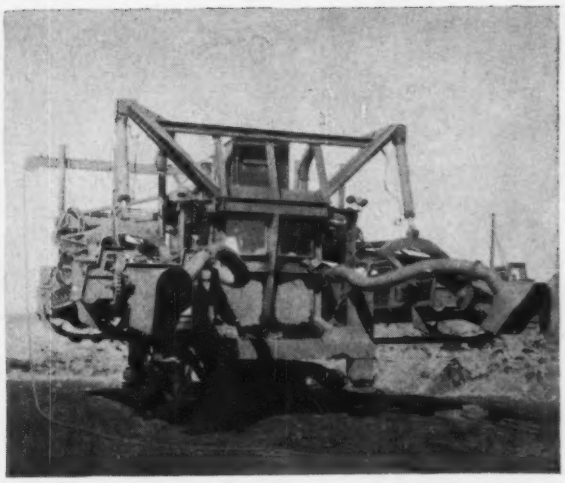
New horizontal dry-type overburden unit on fully revolving shovel-type frame has independently controlled adjustable masts, drills 6¾- to 12-in holes to depth of 90 ft. Operator controls all movements from air conditioned cab.

ABILITY to drill two holes simultaneously, penetration rates up to 45 fpm in shale, independent vertical positioning of drill masts, and remote control of all drill operations are major features of a new horizontal rotary dry-type overburden drill in service at the Power mine, Peabody Coal Co., Montrose, Mo.

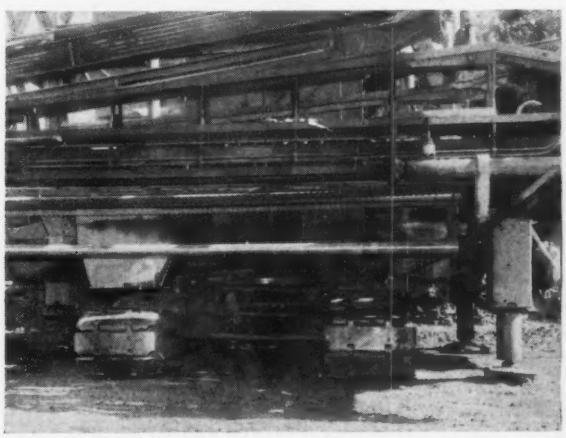
Development of the new Robbins RR12-DH drill marks another step in the search by Peabody officials for new, higher-capacity and more versatile equipment. The idea for a two-headed horizontal drill was sparked during a discussion of high-capacity drilling among Peabody officials and representatives of the Robbins Machine & Mfg. Co. At some of Peabody's properties officials were concerned about the problems of clearing timber, building drill roads and delays caused by vertical drills becoming mired in soft ground. To overcome these problems Peabody wanted a high-capacity sidewall drill that would meet a wide variety of pit conditions, including different types of rock and varying thickness of overburden, and have equivalent or more



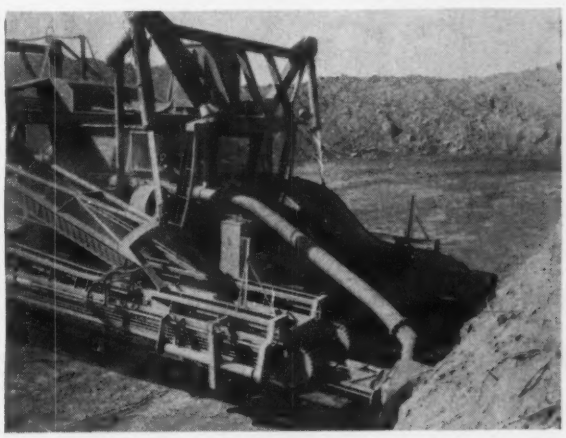
AIR-CONDITIONED CAB has indicator lights at controls to show position of drill pipe in carriage.



FRONT VIEW shows dust-collecting hoods over drill heads. Drill in tramming position with full weight on crawlers.



HYDRAULIC JACKS at each corner of frame level unit before drilling. Jacks also hold drill firmly in place.



OPERATOR PROTECTION against falling rocks is provided by steel framework above cab and bulletproof window glass.

Horizon at Power Mine

capacity than a large vertical unit. The RR12-DH was created to fulfill these requirements. It can drill 6¾ to 12-in holes at speeds equal to modern high-capacity vertical machines.

Drill Features

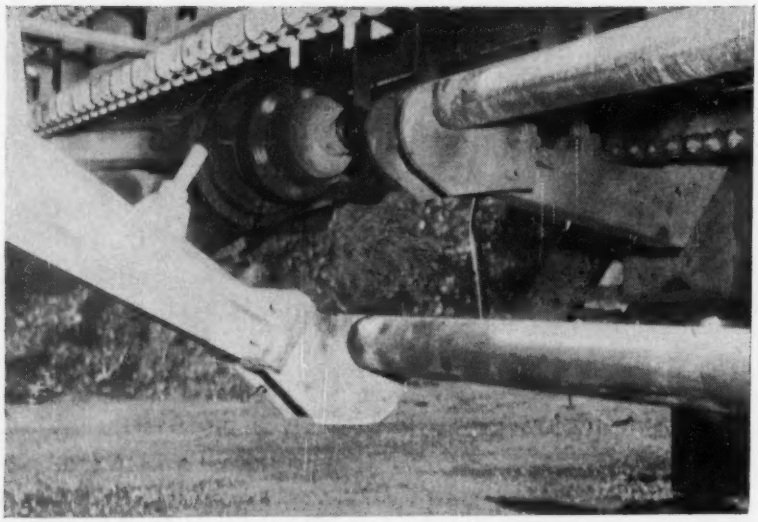
Mounted on two crawlers, the new horizontal drill includes a shovel-type 360-deg revolving frame, four hydraulic leveling and traction jacks, two vertically adjustable drilling masts on 22-ft centers, hydraulically powered pipe racks, rotation and feed mechanisms, and air compressor. Weighing about 150 tons, the unit is 47 ft long, 32 ft wide and 25 ft high.

Drilling pressure on each mast ranges up to 80,000 lb and drilling torque is 80,000 in-lb at rotation speeds ranging from 40 to 120 rpm. The drill head travels forward at a maximum speed of 60 fpm. It retracts at 120 fpm. Two drill heads have adjustable dust hoods that can be moved 2½ ft forward to compensate for irregularities in the highwall.

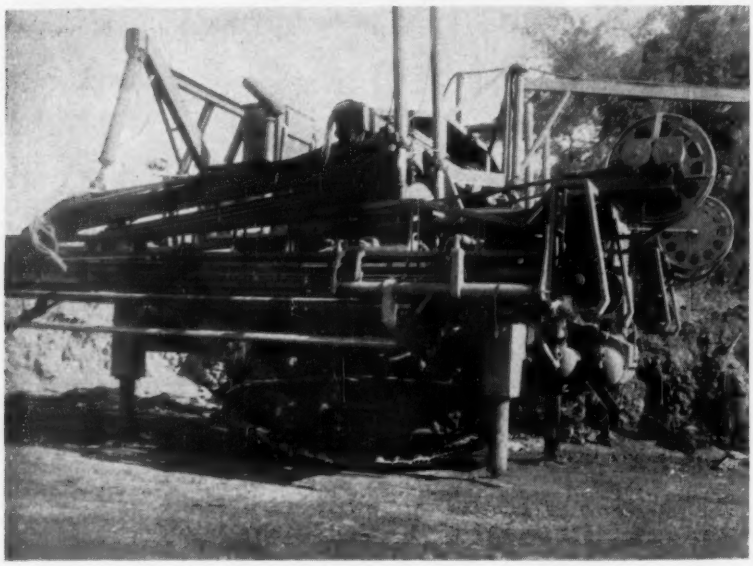
Three 30-ft drill steels, or pipes, are carried in each mast to provide a maximum penetration depth of 90 ft.

Each drill mast has its own set of three hydraulic positioning jacks and hydraulic controls in the operator's cab. By adjusting the three leveling jacks on a mast the operator can start a hole at any level from 2 to 8 ft above the ground. He can also angle either mast from 10 deg below horizontal to 15 deg above.

It takes a total of 455 hp to operate the various drill components. Two 75-hp motors provide bit rotation, two 40-hp motors drive hydraulic pumps, two 10-hp motors operate the Roto-clone dust collectors, one 200-hp motor drives a Joy dual-control compressor for cuttings removal, and a 5-hp motor operates the high-pres-



HYDRAULICALLY POWERED racks position and store 30-ft sections of drill pipe. Raised arm is holding pipe in position for connection to section in carriage.



IN DRILLING POSITION, full weight of unit rests on leveling jacks. Drilling direction is controlled by jacks on each of the masts.

sure-air track and swing clutches. Power is delivered to the drill at 4,160 V and stepped down to 440 V by an Allis Chalmer 500-kva dry-type transformer. A second transformer supplies 110-V power for lights and air conditioning.

Operator safety and comfort rated top consideration in drill design. In addition to working in an air conditioned cab, the operator is well protected. For example, heavy steel beams extending over the top of the cab are designed to protect the operator if loose rock should fall from the highwall. And bulletproof glass enclosing three sides of the cab eliminates the possibility of injury from broken glass.

Two men handle all duties connected with overburden drilling. One man operates the drill from the air conditioned cab and the other man handles the power cable, lubricates the drill, helps spot the drill at the highwall and checks clearances.

Drilling Conditions

Overburden at the Power mine, beginning at the top of the coal, is as follows: 0 to 2 ft of very hard shale with pyrite inclusions, 1 to 3 ft of black shale, 1 to 2 ft of limestone and 8 to 40 ft of shale and clay.

Before the new horizontal drill went into service, drilling horizontal blastholes was a formidable problem. Employing a sidewall auger, the drill crew placed holes in the black shale whenever possible. The crew could bore 10 to 12 6-in holes to a depth of 60 ft in a shift when drilling in the black shale. But when this rock disappeared or became too thin and irregular, holes had to be drilled in the hard sandy shale. Pyrite in the sandy shale sharply increased bit consumption and decreased the rate of penetration.

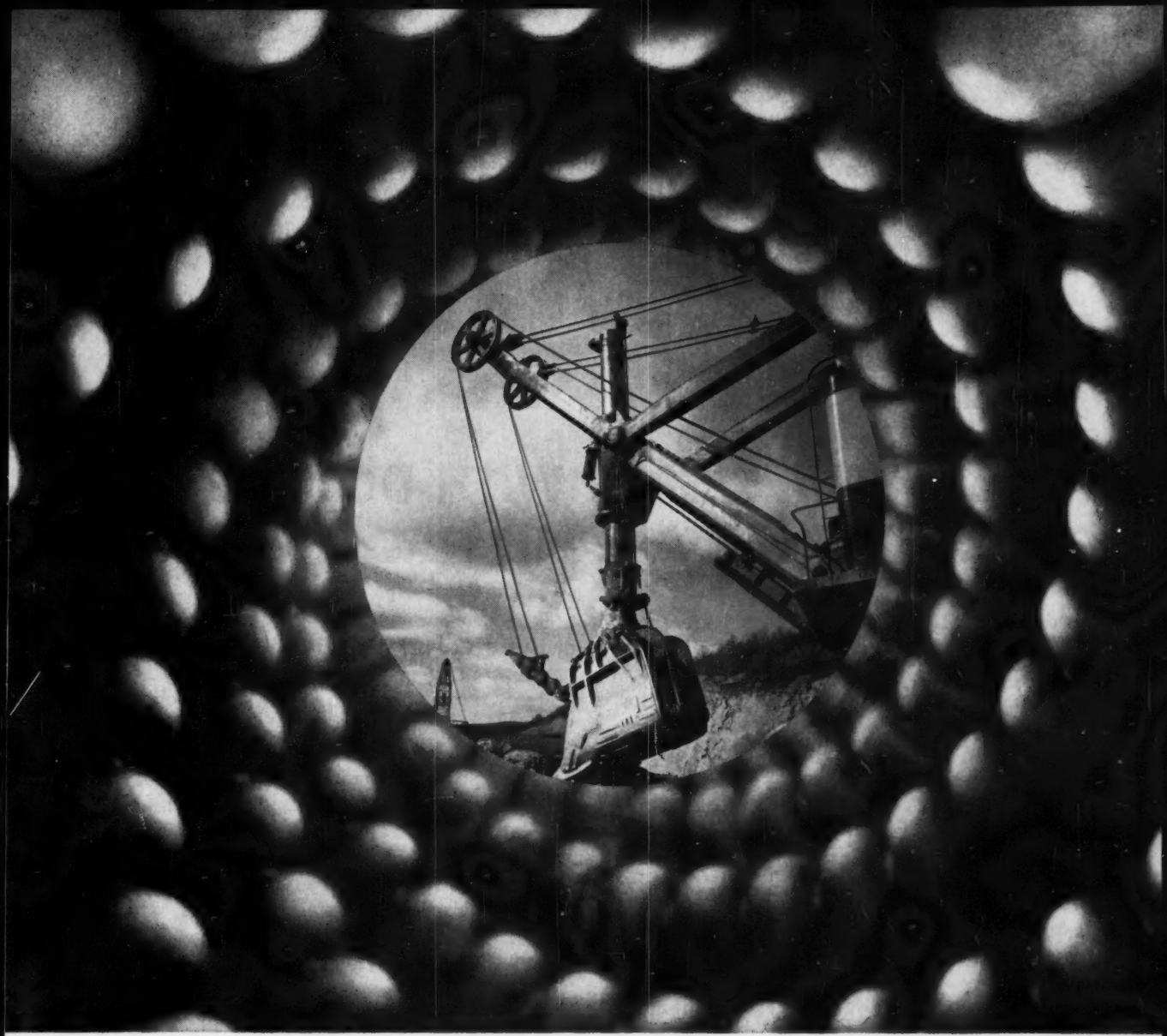
The new RR12-DH drill, equipped with Hughes OWV 6¾-in bits, has demonstrated its ability to drill well over 2,000 ft of hole per shift at Power mine. For example, eight 60-ft holes have been drilled in 1 hr and average penetration is about 360 ft per hour. In tests made by the manufacturer in drilling shale, penetration rate was as high as 30 ft of 10⅝-in hole in 40 sec.

Since the drill was designed as a high-capacity unit for a wide range of conditions, it has ample capacity to meet the future needs at Power mine as overburden becomes thicker or as mine capacity is increased.

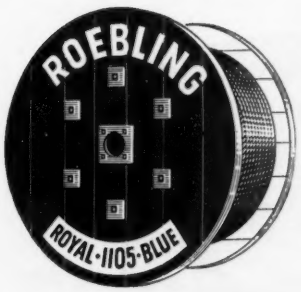
Drilling and Shooting

The RR12-DH drill bores horizontal holes to a depth of 60 to 90 ft and 2 to 3 ft above the top of the coal. Holes are laced with detonating fuse and charged with Olin explosives in the ratio of 1 lb per 7 cu yd of overburden. Millisecond delay connectors are used between charged holes which are detonated in groups of 10 at the end of the shift.

Many small components of the RR12-DH drill, including bearings, hydraulic pumps, gearing, chain and hydraulic hose, are interchangeable or identical with similar parts used on equipment commonly used at a strip mine. Since these parts are warehoused by the manufacturers of the other machines or are on hand at the mine, the parts inventory required for the Robbins drill is a minimum.



ROEBLING ROYAL BLUE WIRE ROPE
DESIGNED AND MADE TO SERVE YOU WELL



ROYAL BLUE: *We put a lot of work into it—You get a lot of work out of it.*

This is the inside view of Roebling Royal Blue — its core has been removed to show the uniformity and symmetry of the rope structure. It's not only what's outside that counts; it's what's *inside* as well. You see how concerned we are with internal security.

All the inspections and tests that Royal Blue goes through enable us to know that the rope we build will do what we sell it to do. These quality control measures help us — as they do you — to take the *long* view of Royal Blue. A brochure on long-lasting Royal Blue, its resistance to shock, abrasion, crushing and bending, is available on request. Ask your Roebling wire rope distributor or write to Roebling's Wire Rope Division, Trenton 2, New Jersey.

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Save on construction costs with the new '61 FORD TRUCKS

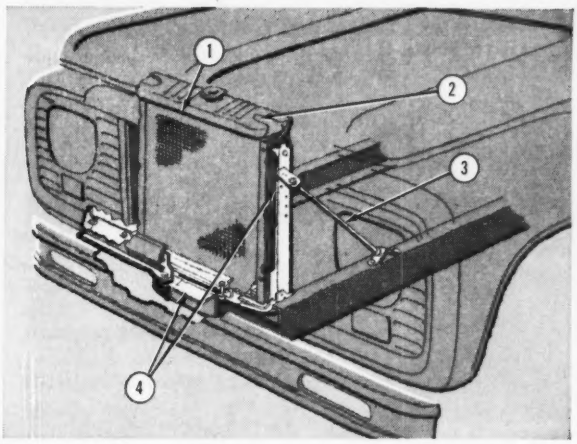
FORD HEAVIES SAVE WITH DOUBLE THE CAB, SHEET METAL AND RADIATOR LIFE

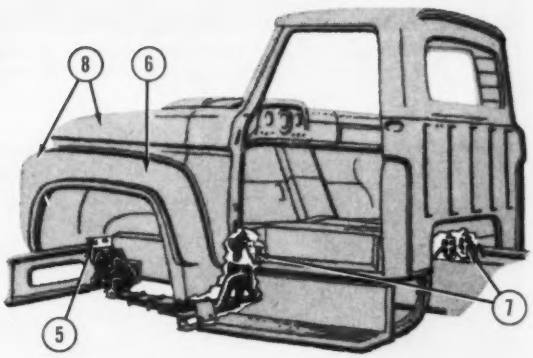
Ford F-Series Heavy Duty models are especially designed for the rugged terrain and tough conditions generally found on construction jobs. Their new independent mounting system for cab and radiator effectively separates both from adjacent sheet metal assemblies for much greater durability. And radius rod-leaf type rear springs provide better axle alignment, a smoother ride and longer spring life.

The electrical wiring system has been improved for greater reliability. Chassis wiring is fastened within the protection of the frame web, away from mud, ice and snow. And Ford Truck frames have been engineered to make the mounting of bodies and special equipment easier. A new 212-inch wheelbase model is available to accommodate extra-long bodies.

Save with Ford T-Series Heavy Duty Tandems for exceptional durability, big payloads and low operating expenses. Ford T-700, T-750 and T-800 Tandems have rugged double-channel frames that are built to take tortuous off-road treatment. And they provide a wider range of chassis options so you can choose the right power train and load-carrying components for any job. Eaton and Timken rear axles are now available in bogie assemblies with 22,000-, 28,000-, 30,000- and 34,000-lb. capacities. And lightweight aluminum walking beams, wheels and gas tanks are available to keep chassis weights low . . . payloads high.

Ask your Ford Dealer about Ford's full tandem line . . . including Super Duties with 38,000-lb. bogies for up to 51,000-lb. GVW!





① **Save with Ford's exclusive "lock-seam" radiator construction** that doubles the solder area at key seams for greatly increased strength and longer radiator life.

② **Save with heavier-gauge metal on radiator tank and header.** Tanks and header have thicker walls to resist vibration, jolts and corrosion for greater reliability.

③ **Save with independent radiator mountings,** separate from front-end sheet metal. This means that road shocks and shakes are not transmitted to the radiator through sheet metal . . . tanks, tubes and connections last longer, require less maintenance.

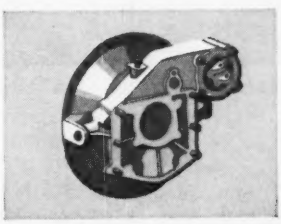
④ **Save with "horse collar" mounting** for extended radiator life. This new mounting on resilient rubber at the center of frame cross member soaks up any frame flexing . . . cuts wear and tear on entire cooling system.

⑤ **Save with independent fender mountings.** Fenders are bolted to a rubber-cushioned transverse bracket at the front and a frame-mounted bracket at the rear. This mounting, independent of both cab and radiator, eliminates stress transfers for increased fender life.

⑥ **Save with removable fenders.** The quick and easy removal of only 8 bolts per fender provides faster service accessibility to the engine area, saving valuable maintenance time.

⑦ **Save with new 3-point cab mounting system** for greater cab durability. Two outboard front mounts plus a centered "twin" rear mount provide a triangular system that holds the cab stationary while allowing the frame to move independently . . . reducing strain on the cab.

⑧ **Save with 42% heavier-gauge sheet metal** in fenders, hood, cab floor pan and toeboard for greater strength, greater durability.



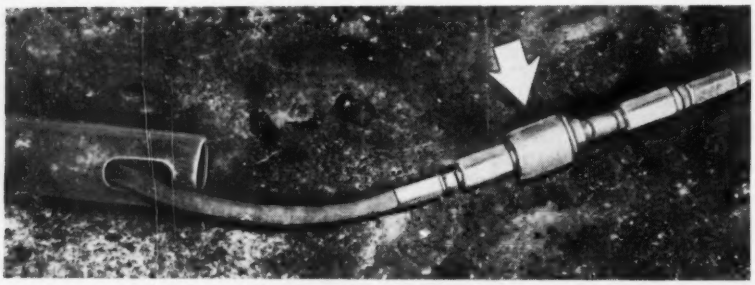
Save with Ford's new Full-Torque flywheel power take-off . . . now available on T-750's and up, to power construction equipment like transit mixers. It's much simpler and more efficient than long, complicated hookups needed with the front-end drives. And the flywheel PTO is lighter in weight—only 105 pounds—for greater payloads.

FORD TRUCKS COST LESS

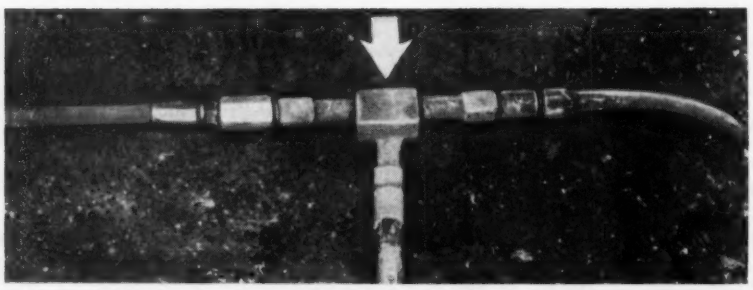
YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" PROVES IT FOR SURE...

FORD DIVISION, Ford Motor Company

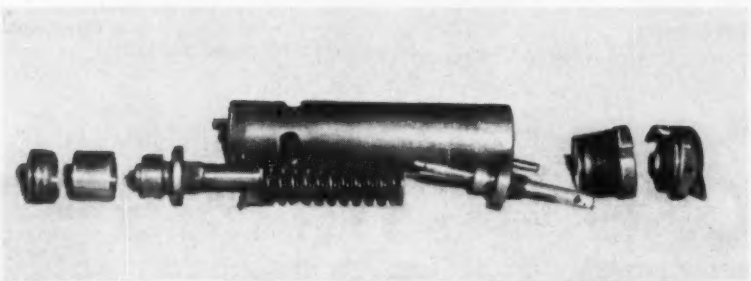
FASTER BREAKING of coal with compressed air is achieved with automatic shells that eliminate the need for slugs or nails. Shooter breaks a cut of coal in 3 to 5 min less time. It takes nine holes per cut in headings, 12 in rooms.



SEQUENCE VALVE makes it possible to discharge two shells from one line.



BRANCH LINES lead from tee in main hose to shells which discharge in sequence.



COMPONENTS of new automatic discharge head include piston, valves and spring.

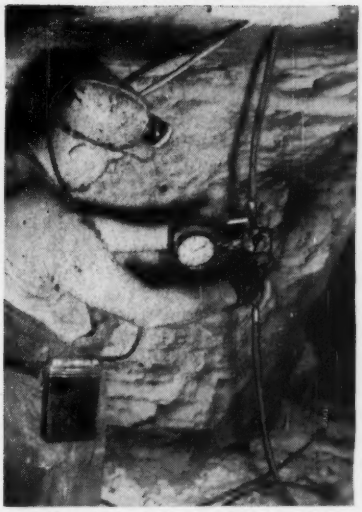
Automatic

Coal is now broken faster and easier at Freeman No. 4 with automatic-head shells and sequence valves. Greater section output is a major benefit.

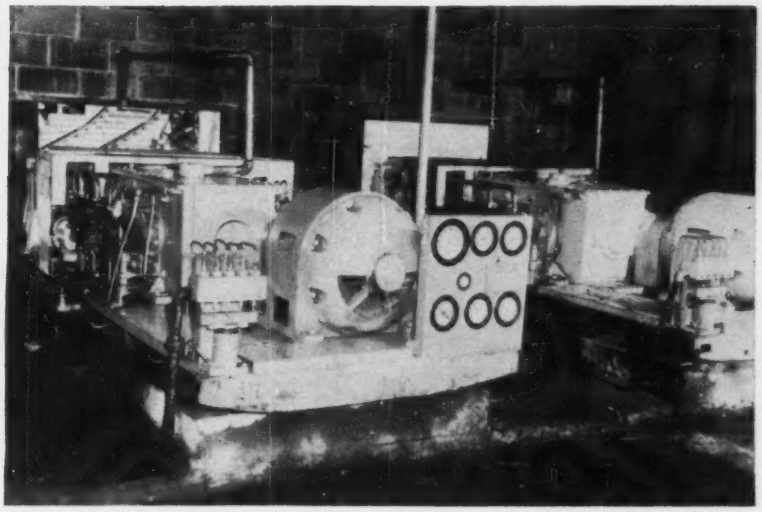
A SAVING of 3 to 5 min in the time required to break a cut of coal results from use of Olin-Mathieson Automatic Airbreaker shells at Freeman No. 4 mine, Freeman Coal Mining Corp., Marion, Ill. An additional saving in coal-breaking time is achieved with a special selector shooting valve that makes it possible to discharge two shells from one air line. Thus the shooter makes only half as many trips to the face.

Freeman No. 4 produces 7,000 tpd from the Illinois No. 6 seam with conventional equipment.

Face preparation practice calls for horizontal cutting immediately above the rock parting to a depth of 9 ft and breaking with compressed air. Headings are cut 15 ft wide and rooms 26 ft wide. It takes nine 3-in shot-holes per heading cut and 12 per room cut to get the proper fragmentation.



SHOOTER spends less time at non-productive chores, makes fewer trips.



CENTRAL COMPRESSORS in surface building provide compressed air for coal breaking at Freeman No. 4. Air is used to break 7,000 tpd of coal.

Delay Shooting With Air

Since the rate of coal breaking governs to a considerable degree the productivity of face crews, the new automatic discharge head and sequence breaking unit make possible greater section output.

The Automatic Head

The automatic discharge head eliminates the need for slugs or nails which were used in old-type shells. After each discharge of an old-type shell a new slug or nail had to be inserted. The shooter now returns to the face as soon as a shell discharges and simply places the shell in a new hole. The head automatically resets itself for recharging by sealing off the outlet ports. An automatic discharge shell works as follows:

As air pressure builds up inside the shell to a preset discharge value a piston mechanism travels forward, contacting an adjustable stem. This stem unseats a ball and releases air from a small forward chamber, permitting a sleeve valve to move forward and release the compressed air in the barrel.

As soon as the air leaves the barrel, the sleeve valve automatically moves back into position for refilling the shell. It is this automatic action that results in the shooter being able to break a cut of coal in 3 to 5 min less time. The shooter opens a set-screw valve at the blowdown station to bleed off residual air in the air line while he is placing the shell in a new hole. This precaution eliminates the possibility of a shell discharging while he is at the face.

Sequence Shooting

The special sequence valve, which makes it possible for two shells to work off one air line, is placed in the air line about 18 in back from one shell and ahead of a tee leading to the second shell. Air feeds to both shells at the same time but one shell is set to discharge at 500 psi lower pressure than the other.

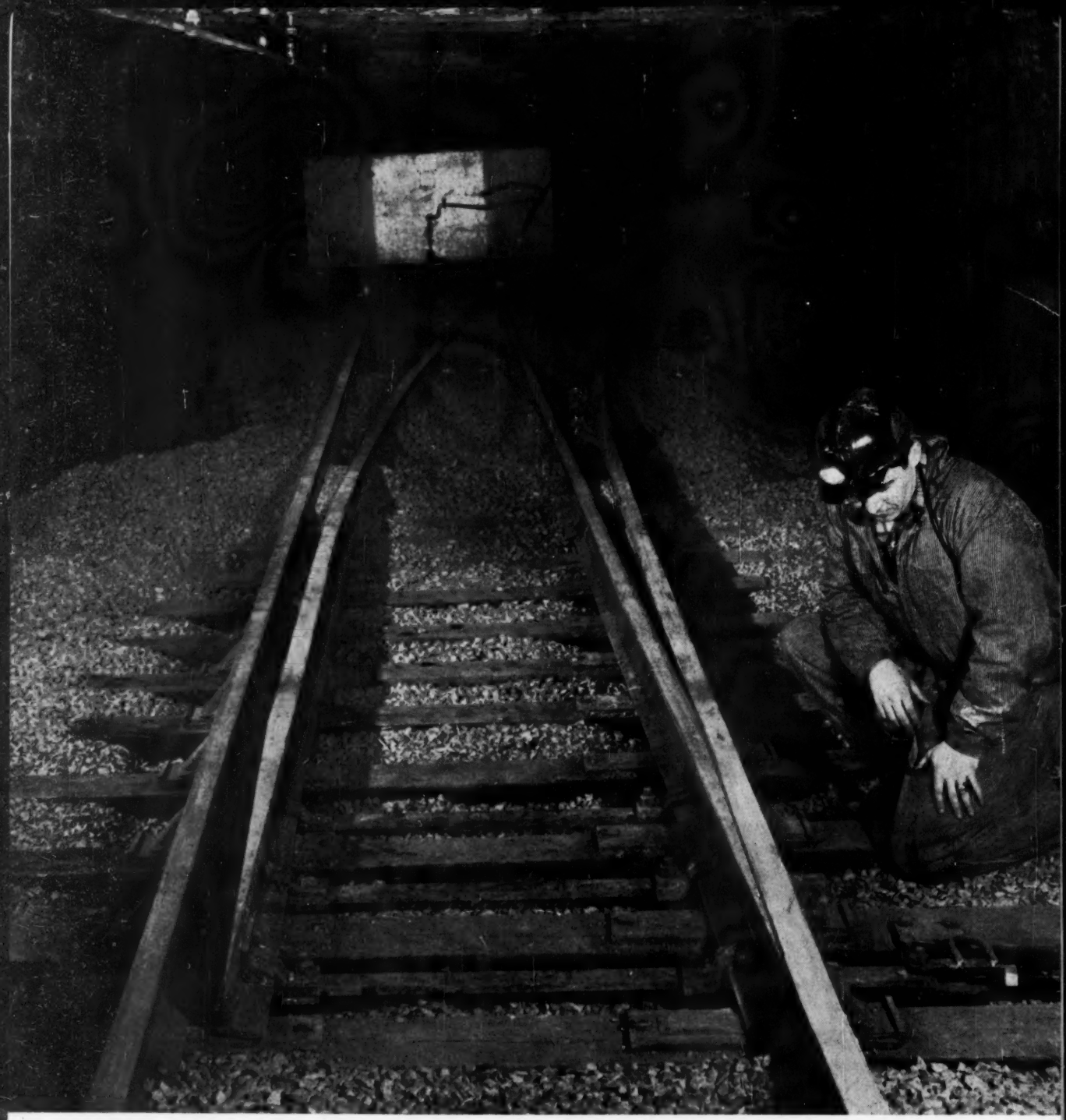
It is possible to adjust the release pressure of the first shell between 5,000 psi and line pressure. The minimum release pressure difference possible between the two shells is about 200 psi.

When the first shell discharges, the sequence valve prevents air from flowing back into it while the pressure builds up in the second shell. After the second shell discharges, the shooter opens the bleed valve at the blowdown station. As soon as the air bleeds from the hose, the sequence valve resets itself and the two shells are ready for refilling.

This improvement in face preparation technique reflects management's basic philosophy of employing new methods to conserve human effort while increasing productivity. For instance, shortly after the mine was opened in 1952 the company developed a number of ideas to improve operations. These ideas included the following:

1. An automatically controlled underground battery-charging station that assures proper charging with a minimum of effort.
2. A wheel-mounted power belt winder for easing the jobs of transporting, adding or removing sections of conveyor belt.
3. A special wheel-mounted lubrication car that can be towed from section to section and solves the problem of handling oil and grease.
4. Time-clock controlled gathering pumps and float-controlled sump pumps.

Freeman management also recognizes the importance of systematic roof control in getting consistently high production, particularly in areas with fragile roof. To provide maximum protection for the production crews, roof bolts are installed up to the face as soon as a cut of coal is loaded. Since much of the mine has friable roof, wood headers are used with the bolts to provide a greater bearing area. With the adequate protection provided at the face well ahead of the preparation cycle, the shooter is able to perform his coal-breaking job in a minimum of time.



TURNOUT TROUBLE?

Not if it's Bethlehem-built! Your tonnages mount and haulage speeds accelerate when you have heavy-duty, high-speed turnouts like this Number 8 at critical points throughout your system. This Bethlehem beauty boasts 85-lb rail and 16½-ft switch points. But chances are that any Bethlehem-made job might iron out your turnout troubles. A Bethlehem engineer would like to present the how and why to you. He's available through our nearest office. Got a few minutes?

Steel for Strength ... Economy ... Versatility

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
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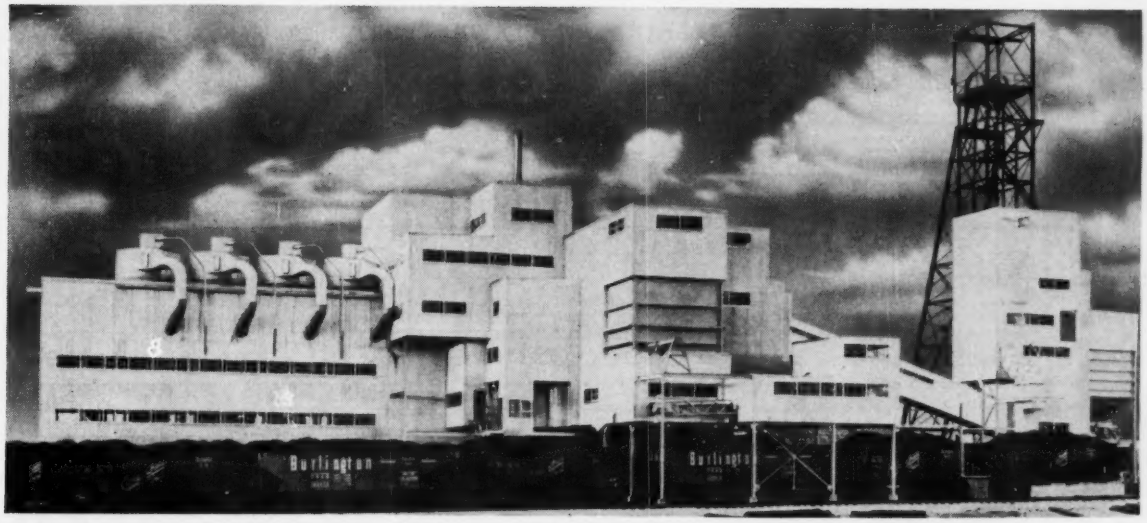


MODERN PREPARATION PLANTS require the best possible maintenance programs. The cost of plant maintenance will continue to increase but it can be minimized by good report- and record-keeping and top quality supervision.

It's time to reevaluate your . . .

Preparation-Plant Maintenance

PREPARATION PLANT MAINTENANCE is probably one of the least-discussed subjects in the industry today. The growth in new-plant construction in the past few years, mass modernization programs to improve plant efficiency and products, and the never-ending program of updating equipment and methods to keep ahead of market demands certainly suggests that an evaluation of your preparation-plant maintenance program is a must.

There is more than one way to approach this task. But first, put aside any thoughts that your program is as good as it can possibly be. If you cannot do this you will be wasting your time.

Whether you are operating a new plant, one that has undergone major changes or even the same old plant, it is your responsibility to evaluate periodically. The time and effort put into it will be well spent and you and your company will benefit, regardless of the outcome.

Basic Information

Start at the beginning. It makes no difference whether it is a new or old plant. If the present program incorporates a report and record system it will help to evaluate such items as cost of labor and replacement parts, unit downtime, frequency of breakdowns, etc. This information will give you an idea of the effectiveness of the present program and also reveal weak areas in the maintenance structure. If the present program does not have a report and record system, it will be worth the time and effort to establish one. It is the only accurate means of measuring the effectiveness of a maintenance program.

Analyze each phase of the program as follows:

1. List all major equipment units and classify them according to their function.

2. Expand the major equipment list by including all components, such as, motors, starters, etc., for each unit. Group these units according to type —electrical, mechanical or hydraulic.

3. Run a cost analysis on each major unit including parts-replacement and labor costs, and its effect on production. Downtime and frequency of breakdowns should be noted.

4. Determine cause or causes for unusually high costs and breakdowns.

At this point you should have a pretty good idea of the effectiveness of the maintenance program. If it looks favorable do not stop the evaluation. There is always room for improvement. On the other hand, if the results indicate "soft spots" in the maintenance program, start making adjustments to eliminate them and by all means continue the evaluation.

Examine Organization Setup

The changing nature of a preparation plant may require adjustments in the organization setup. If the present program was developed with good engineering judgment and common sense only minor changes, if any, will be necessary. If adjustments are indicated be sure to get the support and understanding of top management. Show management the possible improvements and why the action is necessary. It will want to know:

1. Cost of maintenance in relation to production.

2. Operating-time losses due to lack of maintenance and a rundown of where improvements can be made.

3. Maintenance productivity in terms of maintenance cost relative to replacement value of repair parts or equipment, or other comparisons which illustrate the point.

PREPARATION PLANT REPORT

DATE 11/3/58

Weather	Minutes	Weather	Minutes
Dry ✓		Snow	
Rain		Windy	

TEMPERATURES: Beginning of Shift | End of Shift

Mine No. 2 Shift Nite

UNIT #1	UNIT #2	MINE CARS DUMPED 1st	2nd	3rd
2	1	27	48	
3	55	11	54	
4	14	18	43	
9	17		16	
11				
15				
TOTALS		56	161	
TOTAL		217		

PART LOADS AT END OF SHIFT

Car No.	Coal Size	Tons
122296	6 - B	18
50088	6x4	12
134650	4x3	44
56521	1¼m	30
94541	¼ 10	32
126354	6x4	30
	B-95	
	TOTAL	261

R.R. Cars Begin	R.R. Cars End
No. Men Present 9	No. Men Absent 1
Tipple Available Operating Time 7½	Tons of Refuse Hauled 24

PRODUCTION

Item	No.	Tons
50s	14	700
70s	4	280
House Coal		
Part Loads		261
TOTAL	1	241

CLASSIFICATION

Size	Tons
5-B	6 B 50
5x3	8 x4 100
3x2	4 x 3 50
3x1	
2x1	
1x¼	1¼m 500
¼ x 0	280
TOTAL	980

OIL TREATMENT

Size	Tons	Gal. Oil
1¼m	500	
¼ 10	280	
TOTAL	780	

DELAY RECORD

Description of Delay	Minutes	Preparation Time Lost
Out of Coal	—	—
Changing Vib-Screens	15	15
TOTAL	15	15

Description of Repairs and Special Work Performed

Foreman

DAILY PREPARATION REPORTS provide essential information to evaluate effectiveness of maintenance program.

EQUIPMENT CHECKLIST

Foreman's Signature _____ Date _____ NO. 2 TIPPLE ☐ Day ☐ Night

		V	O			V	O			V	O
1.	#1 ROM conveyor			21.	Large Simpl. vibrator			41.			
2.	New ROM conveyor			22.	Small Simpl. vibrator			42.	Dump		
3.	Rescreen conveyor			23.	Low head vibrator			43.	Car spotter		
4.	Refuse conveyor			24.	Small Maynard vibrator			44.			
5.	Hydro separator Conv.			25.	Large Maynard vibrator			45.	Car retarder		
6.	¼ x 0 long dust drag			26.	Slurry vibrator			46.	Truck coal feeder		
7.	Crusher conveyor			27.				47.	#1 ROM feeder		
8.	Remixing conveyor			28.	Lump boom			48.	#2 ROM feeder		
9.	Sludge tank conveyor			29.	Egg boom			49.	#3 ROM feeder		
10.	Misc mech			30.				50.			
11.				31.	R & S Hydro separator			51.			
12.				32.				52.			
13.	Belt conveyor ¼ x 0			33.	Baugham Dryer			53.			
14.				34.	Dust collector			54.			
15.	GD elevating conveyor			35.				55.			
16.	¼ x 0 elevating conveyor			36.				56.			
17.				37.	Recirculating pump			57.			
18.	Crusher			38.	Fresh water pump			58.			
19.				39.	Oil pump			59.			
20.				40.				60.			

OTHER EQUIPMENT:

STATE EXACT REASON FOR EVERY "O" ON CHECK LIST

EQUIPMENT CHECKLIST facilitates inspections and provides necessary equipment details.

Preparation Plant Delay Account Code

1. R-O-M Conv., 42-in belt
2. No. 7 conv., 30-in belt
3. Washer refuse conv., 30-in belt
4. Oversize conv., 24-in belt
5. Crushed ¼x0 conv., 24-in belt
6. (Future Use)
7. Stockpile conv., 24-in belt
8. Transfer belt
9. (Future Use)
10. Misc. mech.
11, 12. (Future Use)
13. Crusher conv., flight
14. No. 10 cross conv., flight
15. Rescreen drag conv., flight
16. Slack drag, No. 1 conv., flight
17. ¼x0 long dust drag, flight
18. ¼x0 dust conv., flight
19. ¼x0 dust conv., flight (drag to RR car)
20. Sludge conv.
21-23. (Future Use)
24. Gravity-discharge elevating conv. buckets
25. No. 1 comp. refuse elev., bucket
26. No. 2 comp. refuse elev., bucket
27, 28. (Future Use)
29. Vibrating conveyor, 20x30 ft
30. Primary crusher
31. Secondary crusher
32. (Future Use)
33. No. 1 vibrating screen
34. No. 2 vibrating screen
35. No. 3 vibrating screen
36. No. 4 vibrating screen
37. No. 5 vibrating screen
38. No. 6 vibrating screen
39, 40. (Future Use)
41. Slurry vibrator
42. Low-head vibrating screen, stockpile
43. Primary shaker
44. Classifying shaker
45. Picking table
46. (Future Use)
47. No. 1 boom belt, No. 3 track
48. No. 2 boom flight, No. 4 track
49. Egg boom flight. No. 5 track
50. Lump boom flight, No. 6 track
51, 52. (Future Use)
53. Washer
54. (Future Use)
55. Air blower and compressor
56. R-O-M feeder at dump
57. Slurry pump
58. Recirculating pump
59. Fresh water pump
60. Oil pump
61. No. 2 layer loader
62. No. 3 layer loader
63. No. 4 layer loader
64-70. (Future Use)

Nonmechanical

101. No coal from mine
102. Misc. nonmech
103. Changing screens
104-110. (Future Use)

DELAY ACCOUNT CODE simplifies report and record-keeping.

TIPPLE NO. 2
DELAY SUMMARY

Month _____

Code No.	Minutes Operated UNIT	DAY Min.	DAY Prep. Delay	DAY F	NIGHT Min.	NIGHT Prep. Delay	NIGHT F	TOTAL Min.	TOTAL Prep. Delay	TOTAL F	TOTAL %
1	#1 ROM Conv.–30" belt										
2	New ROM Conv.–30" belt										
3	Rescreen Conv.–flt.										
4	Refuse Conv.–flt.										
5	Hydro-Separator Conv.–flt.										
6	¼ x 0 Dust Drag–flt.										
7	Crusher Conv.–flt.										
8	Remixing Conv.–flt.										
9	Sludge Tank Conv.–flt.										
10	Misc. Mech.										
13	Belt Conveyor–¼ x 0										
15	G.D. Elevating Conv.–bkt.										
16	¼ x 0 Elev. Conv.–bkt.										
18	Crusher										
20	Low Head Vibrator										
21	Large Simplicity Vib.–#1										
22	Small Simplicity Vib.–#2										
24	Small Maynard Vib.–#4										
25	Large Maynard Vib.–#5										
26	Slurry Vibrator										
28	Lump Boom										
29	Egg Boom										
31	R & S Hydro separator										
33	Baugham "Verti-vane" Dryer										
34	Dust Collector										
37	Recirculating Pump										
38	Fresh Water Pump										
39	Oil Pump										
42	Dump										
43	Car Spotter										
45	Car Retarders										
46	Truck Coal Feeder										
47	#1 ROM Feeder										
48	#2 ROM Feeder										
49	#3 ROM Feeder										
	TOTAL MECH. DELAYS										
	NON-MECH. DELAYS										
101	No Coal From Mine										
102	Misc. Non-Mech.										
103	Changing Screens										
104	Wreck on Dump										
105	Slate										
106	R. R. Cars										
	TOTAL NON-MECH. DELAYS										
	GRAND TOTAL										

MONTHLY DELAY SUMMARY permits quick discovery of trouble spots in the plant operation before serious difficulties develop.

Reappraise Maintenance Standards

Plant changes make it necessary to analyze maintenance standards. Look for changes that could alter standards and note, especially, signs of the organization drifting away from established standards. Those things which a maintenance organization must have if it is to be successful are:

1. An organization capable of performing all maintenance functions effectively.
2. An organization chart listing the responsibilities and authority of each maintenance supervisor and also the main duties of electricians and mechanics.
3. A neutral reporting medium for operating and maintenance department heads, including rigid chain-of-command policy within the maintenance department and between it and the various operating departments.
4. A preventive-maintenance program.
5. An effective cost-control program.
6. A complete report and record system.
7. A good supply system.

A weakening of any one of these will automatically weaken the others.

Reevaluate Work Activity

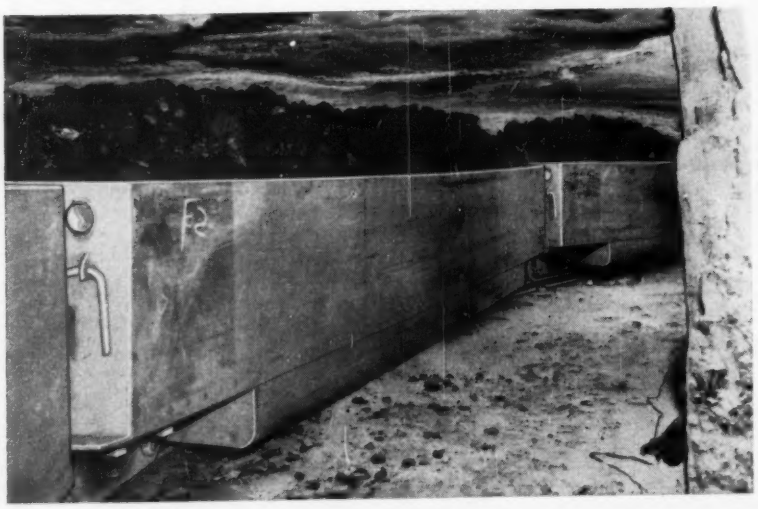
It is necessary to evaluate work activity more often than any other phase of maintenance. There is an inherent tendency to become lax or to bypass sound and time-tested work activities if frequent checks are not made. Basically, there are five work classifications that should be checked:

1. Preventive maintenance.
2. Repair.
3. Overhaul.
4. Construction.
5. Salvage.

What might seem to be a logical approach to a maintenance problem from an engineering standpoint may not prove economical. Consequently, each phase of a preventive-maintenance program must be evaluated from an economical as well as an engineering point-of-view. Too much time-lapse between work-activity checkups could lead to far too many PM measures that are not economically sound. The PM program should provide the following seven benefits:

1. Minimum production downtime.
2. Fewer major repairs and overhauls.
3. Less man-hours spent on overtime.
4. Lower maintenance costs—labor and material.
5. Fewer spare-equipment units.
6. Better control of spare-parts units.
7. Greater safety for workers.

Periodic evaluation of a preparation-plant maintenance program is essential. A good report and record system will reduce the amount of work involved and provide a much clearer picture of the overall setup as well as individual phases of the program. If a report and record system is not part of your maintenance program now be sure to put it on your "must" list for 1961.



haulage capacity...

Place: Powhatan #1 Mine

Operator: North American Coal Corporation

Car Dimensions: Length 21' 6" (body)
Width 6' 6"
Height 42" (above rails)
Weight 8200 lbs.

Capacity: 395 cu. ft. (level load)
465 cu. ft. (crown load)

where can you match it?

Since 1915 — Pioneers in haulage equipment

DIFFERENTIAL STEEL CAR COMPANY
FINDLAY, OHIO

14 Yard Bites – 160 Foot Boom

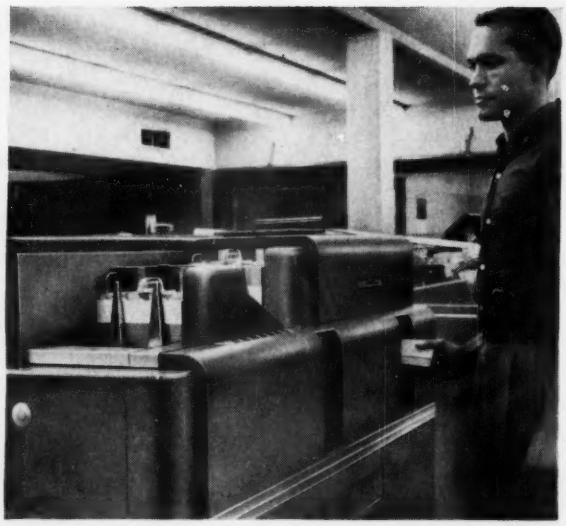
This Illinois coal mine counts on two Marion 7400 Walking Draglines to uncover two parallel seams at a rate that keeps the Marions busy around the clock. Truly matched buckets and booms, adequate power for consistently fast cycle time and ability to work and travel almost anywhere help Marion Walkers produce big yardage at low unit costs. Marion Walkers are available in boom lengths up to 300 feet and bucket capacities up to 45 yards. Why not let a Marion mining specialist project Marion Walking Dragline unit costs for your property?

CONSULT **MARION** MINING SPECIALISTS
for lowest costs on your property!

MARION POWER SHOVEL COMPANY • Marion, Ohio, U.S.A.

A Division of Universal Marion Corporation

SHIPPING NOTICES, envelopes and invoices are printed on accounting machine from decks of cards processed during various runs of computer and other automatic equipment. Reports used by management in charting Clinchfield's growth also are printed on accounting machine.



WHEN SHIPMENT IS MADE and actual tonnage figures reported by the railroad, waybill cards are punched. They are matched to shipment cards and run through reproducing punch which transfers the net hundredweight from the waybill cards to the shipment cards.

Computer Improves Shipping

Ralph E. Rose Jr., Manager
Data Processing Dept.
Clinchfield Coal Co.
Dante, Va.

A RANDOM ACCESS electronic computing system and a tape-producing teleprinter communications network have joined forces at Clinchfield Coal Co., Dante, Va., to help us process nearly three times as many shipments in one-half to one-third the time it formerly took. And the operation is almost completely automatic. Now that most manual functions have been eliminated, we process a single day's Virginia shipments (800 cars) in 1 hr. Previously, it took us 2 to 3½ hr to handle 300 cars.

By storing most of the information on the memory unit of the computer, we turn out a monthly traffic analysis showing actual routing by state, destination and method of movement, including the total number of cars and the estimated tons shipped. This data was impractical to compile in the past because it took so long and was not available in time to be of value.

Our inland sales agent, who formerly needed 20 people to do the invoicing and compile statistics, is now

ESTIMATED REALIZATION REPORT FOR 8-06-60

MINE		NO CARS	EST. TONS	EST. REALIZATION	PER TON
MOSS 1	TODAY.....	17	971.00	6085.60	6.27
	MONTH TO DATE.....	423	23656.00	156606.21	6.62
MOSS 2	TODAY.....	112	6496.00	39300.80	6.05
	MONTH TO DATE.....	512	31686.00	193542.41	6.11
MOSS 3	TODAY.....	446	26916.00	186246.08	6.92
	MONTH TO DATE.....	1225	78202.00	545850.01	6.98
# 52	TODAY.....	3	177.00	920.40	5.20
	MONTH TO DATE.....	66	3739.00	20214.70	5.41
WILDER # 1	TODAY.....				
	MONTH TO DATE.....	42	2718.00	14079.24	5.18
TOTAL	TODAY.....	578	34560.00	232552.88	6.73
	MONTH TO DATE.....	2268	140001.00	930292.57	6.64

VITAL SUMMARIES having current value to management

INFORMATION on tape is sent via teleprinter to Clinchfield's sales offices. Orders, in the form of punched paper tape, are received by teleprinter from the New York sales office and converted to cards using the tape-to-card converter shown above.

THE AUTHOR, Ralph E. Rose Jr.

Electronic computer and communications network slash shipment-processing costs for Clinchfield Coal Co.

getting along with less than half that number because his invoices and most of his statistics are processed automatically at Clinchfield's home office. One of the most important aspects of the system is that we can expand shipments, and related jobs, up to 100% without adding machines or personnel in the Data Processing Dept.

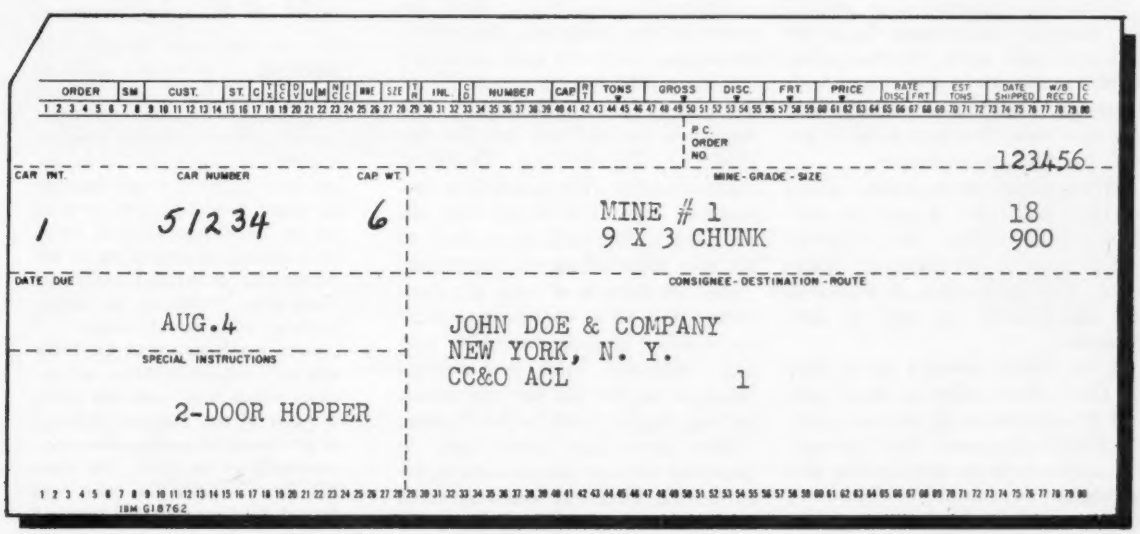
If Clinchfield's history is any indication of the future, we will need this ability to expand. In fact, as Moss No. 3 Mine, one of the largest bituminous coal mines in the world, reaches maximum production, we expect to far outstrip our present 11-million ton annual output. Ranked fifth among the nation's coal producers in 1959, Clinchfield mined only 4 million tons 9 yr ago.

The company's holdings now include three large mines and preparation plants in southwestern Virginia, three mines in northern West Virginia, and one in Tennessee.

We also have a substantial hardwood lumber operation, sawing 6 million bd ft a year. Our stores gross $2 million annually and we're producing some natural gas and lightweight aggregate, the latter a new venture for us.

Clinchfield Coal Corp. was chartered in Virginia in 1906. The Pittston Co. acquired a majority of the stock in 1944 and, late in 1956, the firm was merged with Pittston and renamed the Clinchfield Coal Co. Our division employs 3,300 people.

We acquired our electronic computer, an IBM RAMAC 305, in April 1959. The name RAMAC stands for random access method of accounting and control. The computer contains a magnetic disk storage unit that has a capacity of 5 million characters of



are valuable byproducts of the electronic computing system.

data in 100-character groups. Random Access permits the posting of transactions in the sequence in which they occur without batching so that records are always up to date.

Orders are taken in our sales office in New York, Chicago, Cleveland and Spartanburg, S. C. They are gathered in New York, and transmitted by teleprinter to our Dante, Va., headquarters.

Orders are received at Dante on punched paper tape and printed on a two-part form on the monitor. The tape and monitor copies contain date, order number, code numbers for state, customer and salesman, customer order number, sold to, ship to, routing, grade and size of coal, quantity, type of equipment, gross price f.o.b. mines, freight rate (if freight is to be prepaid), shipping instructions and special instructions.

The original of the two-part form is sent to our shipping department for use in scheduling production. The carbon copy and tape are brought to the data processing department.

There, the tape is converted to punched cards on an IBM 47 Tape-to-Card Converter. Then, the cards are run through and IBM 108 Card Proving Machine which edits them for accuracy.

From the customer number appearing on the card, an abbreviated "ship to" name card is pulled from a master file. Both cards are then fed into the computer, which stores the data appearing on them. The master cards are returned to their file and the order cards filed for reference.

When the shipment date arrives, the shipping department types or addressographs cards showing order number, mine, grade and size of coal, consignee, destination, routing, and shipment date. One card is made for each car load to be shipped.

When shipment is made, billing clerks at the mines phone the railroad card number and capacity weight code to the shipping department. This information is added to the cards, which are sent to data processing.

A key punch operator at an IBM 26 Card Punch takes a blank card and punches into it all information on the handwritten card. The handwritten card is kept for two months as a reference.

The punched shipment cards are sorted by car number and order number on an IBM 82 Sorter and the cards go into the computer. For each order processed, the computer produces one set of three cards, containing the information fed into it and the data stored earlier on the disks.

Simultaneously, a fourth card is produced by the computer, which automatically reviews stored master information. This card shows the mine, coal size and estimated weight of the shipment. Another card is summary punched with the number of cars and estimated tons compiled by order number, mine, size and routing. The computer, meanwhile, tabulates the realization (estimated dollar value) by mine and stores it.

The summary cards are separated and held. The remaining cards are sorted by customer number and matched to a master file of mailing addresses. The matched deck is run through an IBM 407 Accounting Machine which prints continuous envelopes and shipping notices.

The order and shipping cards are sorted by salesman's number and listed on the accounting machine to produce the salesman's notice of shipment report, containing everything on the shipping notice, plus mine, size and estimated weight.

Next, the order cards are sorted out and destroyed. The shipment cards are sorted by car number and merged into a shipment suspense file to await the report from the railroad on the actual weights. When that arrives, the estimated weights are revised where necessary.

Meanwhile, the summary cards are sorted by size, mine and sales office. Description cards for each mine and size are pulled from a master file at the end of a day's activities. The decks are merged and fed into an IBM 63 Tape-to-Card Converter which transfers the information into punched tape. This taped data on the day's shipments is transmitted to our four sales offices via teleprinter.

Also, at the end of a run the computer prints on its console typewriter the number of cars, estimated tonnage, estimated value and average value per ton for the day and month to date, plus the total for the division.

The description cards used in punching the tape are returned to the master file, while the summary cards are held until the end of the week. The summary cards are used to produce weekly and monthly shipment summaries for the shipping department. The cards are also used for other monthly shipment analyses.

The above system applies only to our Virginia mines although our West Virginia activities are processed in much the same manner on the RAMAC 305.

Our shipment-invoicing system is not the only major application of the RAMAC 305. Payroll processing, for example, has enabled us to transfer 15 clerical workers to more productive jobs. The payroll is handled quickly and accurately, and associated reports, produced automatically, are much more detailed and timely.

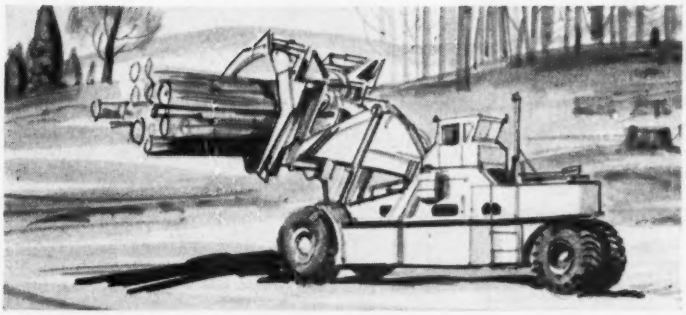
The computer is serving us in the scientific field, too. A survey traverse that formerly took 15 hr to calculate is now processed in 20 min. Possibly the best indication of our satisfaction with this equipment is the fact that we are installing a second RAMAC 305 to keep track of 30,000 spare machine parts.

50 Yr Ago...

. . . the first issue of *Coal Age* appeared, as a weekly publication. The first issue, dated Oct. 14, 1911, presented a number of mining plans for anthracite and bituminous mining, a practice which has been followed down through the years. Loading machines were yet to be developed, but there were numerous references to the advantages of cutting machines. Ventilation received a major share of editorial attention.

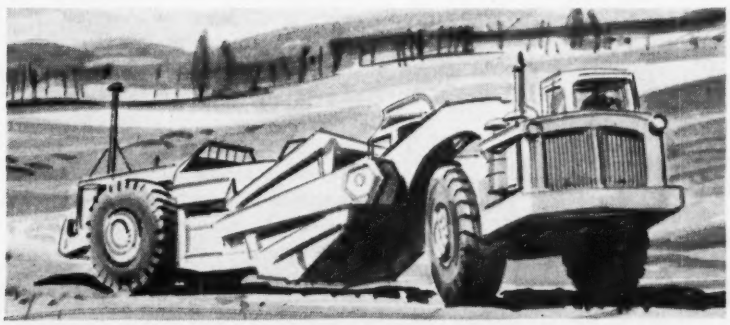
Coke manufacture at the mine was an accepted practice, an activity which may come full circle in view of the renewed interest in processes for making coke economically at the mine. The market for Connellsville coke was firm at $2.00 for standard contract grades.

ALLISON
speeds big loads
TORQMATICALLY



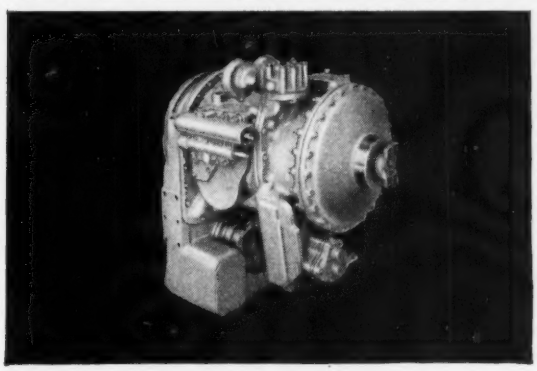
IN "LUMBER JACKS"

Despite a 70,000-lb. lift and carry capacity, the Wagner LJ 3-70 Lumber Jack is designed for fast work in mass-production operations. Its CRT-5630 TORQMATIC DRIVE lets the operator quick-shift at full throttle to speed loads—one reason why it is standard equipment in this machine.



IN TWIN-POWER SCRAPERS

One contractor who owns a Euclid TS-24 Twin-Power scraper reports: "One Twin is equal to five 130-h.p. crawlers with 10-yd. tow-type scrapers." Another says: "One Twin is equal to three 12-yd. self-propelled scrapers plus pusher." Typical? You bet. And the CRT-5630 is one of the TORQMATIC team members that make twin power possible.



IN ANY 200-300 H.P. UNIT

For that scraper, king-size loader or four-wheel prime mover, you'll find faster job cycles and lower maintenance costs with the job-proved CRT-5630 TORQMATIC DRIVE.

It has 3 speeds forward and 3 reverse, planetary direction and range gearing, transfer gearing drop box incorporating front- and rear-output flanges. With six choices of TORQMATIC converters to give that perfect engine match, the CRT-5630 is ideal for a wide range of machines and jobs.

Want more information? Send for the fact-packed CRT-5630 brochure today.

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TORQMATIC® DRIVES

The world's most complete line of hydraulic drives

Over 980 models used by 108 manufacturers in 100 to 525 H.P. equipment

Allison Divison of General Motors
Dept. CA-2, Indianapolis, Indiana

Please send me application data on your CRT-5630 TORQMATIC DRIVE.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

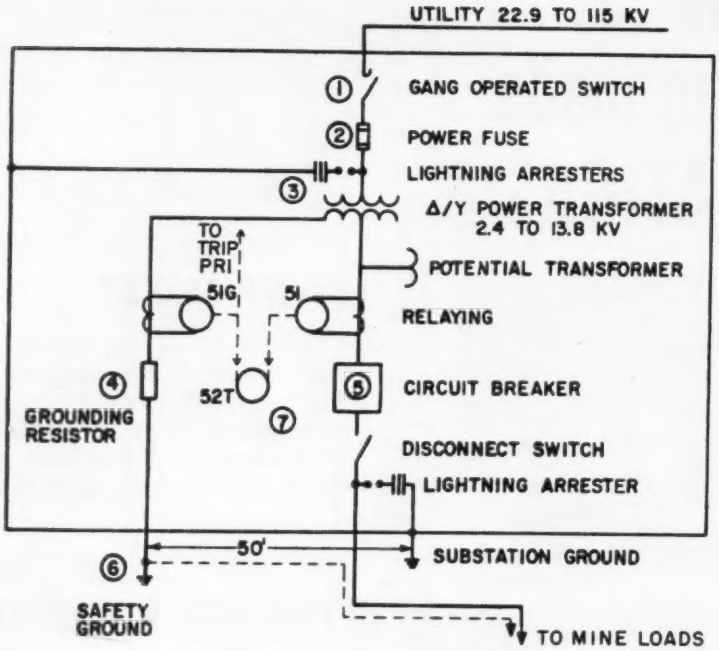


FIG. 1–SCHEMATIC diagram of substation.

Trends in Open-Pit Mine Power Distribution

A. C. Lordi, Mining Industry Engineer
Westinghouse Electric Corp.
East Pittsburgh, Pa.

TEN YEARS AGO the "largest" stripping shovels and draglines had total connected loads in the order of 2,000. These machines drew peaks in the order of 3,000 and were considered difficult loads to supply at distances approaching 2 mi from the substation. Five years ago the advent of the 60- to 70-cu yd stripping shovels upped connected horsepowers to the order of 4,650 hp of main AC driving motors with peak loads of 7,500 kw. Power at 7,200 V was required to drive these machines. Present thinking includes shovels of 115-cu yd capacity with 12,000 hp of main drive AC motors and peak expected loads in the order of 17,500 kw.

We have no reason to believe that these machines have reached any limit in size. Rather, shovels and draglines may continue to increase in size to enable removing the overburden from deeper seams of coal at faster rates.

To supply the large fluctuating loads represented by these machines with their attendant auxiliary equipment loads requires that the distribution system be planned more carefully than ever before. Safety, capacity, flexibility, equipment protection, and voltage regulation become increasingly important. A safe reliable distribution system is a necessity to enable a return on the large investment tied up in the machines.

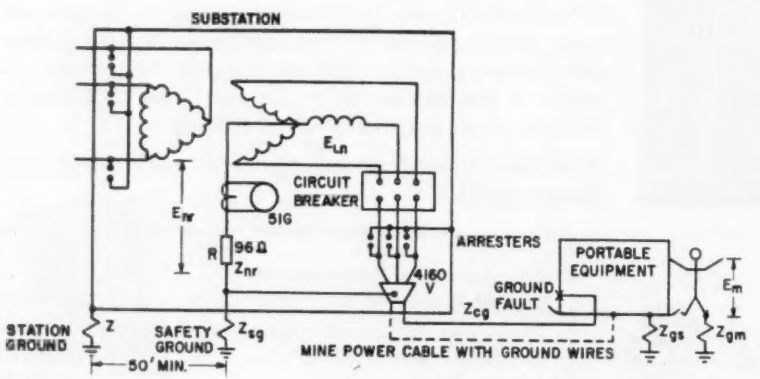
The major items of electrical distribution apparatus involved are:

1. The main substation, including equipment which transforms the incoming transmission line voltage from the local utility to a primary distribution voltage for the mine.

2. Portable substations, including equipment which transforms the primary distribution voltage down to a lower distribution voltage for the smaller machines not suitable for operation on the primary distribution voltage.

3. Portable switchhouses, including equipment which automatically protects the distribution circuits at the distribution voltage level(s) and enables flexible isolation and control of mine feeders.

4. Portable power centers, including equipment which transforms power from the distribution voltage to utilization voltages of 600 V and below for auxiliary equipment.



$I_{gf} = E_{Ln}/(Z_{nr}+Z_{cg}) \leq 25$ AMP
$E_m = (I_{gf})(Z_{cg}) < 100$ V
I_{gf} = SINGLE LINE TO GROUND FAULT CURRENT
Z = SUBSTATION GROUND IMPEDANCE TO EARTH
Z_{sg} = SAFETY GROUND IMPEDANCE TO EARTH
Z_{nr} = NEUTRAL GROUNDING RESISTOR IMPEDANCE
E_{nr} = VOLTAGE DROP ACROSS RESISTOR "R"
Z_{cg} = CABLE GROUND WIRE IMPEDANCE
E_{Ln} = LINE TO NEUTRAL VOLTAGE
Z_{gs} = EQUIP. IMPEDANCE TO EARTH(MAY BE $>> Z_{gm}$)
Z_{gm} = MAN IMPEDANCE TO EARTH
E_m = POTENTIAL TO WHICH A MAN MAY BE SUBJECTED

FIG. 2–FRAME VOLTAGE with single phase to ground fault.

Mr. Lordi's presentation at the 16th annual meeting of Open Pit Mining Association at Purdue University, Lafayette, Ind.

5. Transmission lines, cables, and cable couplers which carry power at the voltages used in the mine between the above electrical apparatus and eventually to the loads served by the distribution system.

The prime considerations in the choice of electrical apparatus used to perform these functions are safety, voltage regulation, reliability, and cost. These considerations are discussed briefly as they apply to the above items which supply power to the ever-changing open-pit mine loads.

Characteristics of Excavator Loads

The power demands of a shovel or dragline vary over a wide range during each operating cycle, from high peak loads of 200% rated horsepower during digging and hoisting, to negative regenerative loads approaching 80% of rated horsepower during plugging conditions. Cycle times of large shovels and draglines are in the order of 45 to 70 sec.

To help maintain voltage within reasonable limits during these wide load fluctuations, kvar compensators or regulators are used to increase synchronous set drive motor field excitation during peak loads, increasing leading kvar. This changing of reactive kva during the load fluctuations helps compensate for the voltage regulation occurring in the transformers and transmission lines due to their inherent inductive reactance. The large excavator set AC drive motors are usually full voltage started, requiring from 350 to 450% inrush at approximately 30% lagging power factor. In the case of the large excavators presently using up to 3,500 hp in a single motor, full voltage inrushes in the order of 12,500 kva may be realized. A poor power factor load of this nature, suddenly applied, results in an appreciable shock to most utility systems as well as to the mine distribution system. The local utility should be made aware of the starting requirements as well as the normal load swings of the excavators early in the planning stages of the distribution system.

The Main Substation

To supply the large blocks of power demanded by modern mines, utilities usually supply power to the vicinity of the mine at a transmission line voltage. These voltages range from 22.9 to 115 kv. Thus, a substation is required to transform the incoming line voltage down to a distribution voltage which can safely be handled for the portable loads.

Fig. 1 is one line diagram of a typical single-ended substation used in the modern open pit mine. The equipment used in this substation is as follows:

1. Gang-operated disconnect switch rated for line voltage, load current, and momentary short circuit capacity. This switch serves to isolate the incoming line from the substation and is called upon to interrupt transformer exciting current. If this switch is not capable of interrupting the full loads normally experienced, it should be key interlocked with the main secondary breaker. Substation sizes are increasing and primary voltages getting higher. Hookstick operated devices are not satisfactory for the service required by this switch.

2. Power fuses chosen on the basis of continuous current rating, voltage rating, and interrupting capacity. These fuses act to isolate the substation on primary faults. Fuse ratings must be coordinated with the protective relays on the power system. Usually, fuses rated at 1½ to 2 times full load current are used. The trend to substation requirements above 5,000 and possibly to 15,000 kva requires stiffer transmission lines with higher short circuit capacities. Power fuse required ratings are increasing.

The use of a primary circuit breaker instead of primary fuses is desirable to better protect the substation apparatus. A primary breaker would allow sensitive differential relaying around the substation, eliminate the ever present single phasing problem, and eliminate the fuse coordination problem. Fast sensitive relays would also protect the substation on secondary ground faults which may occur between the tansformer and main secondary breaker. These ground faults, when limited by a neutral grounding resistor, are not seen by primary fuses.

When primary fuses instead of a primary breaker are used, some means should be provided for isolating the substation on transformer and secondary bus line to ground faults. Tripping of the secondary breaker is not enough because it does not remove power from the faulted transformer or bus. Transfer tripping or a primary grounding switch activated by a transformer neutral ground relay can be used to effect substation isolation via a remotely located primary breaker.

Station class lightning arresters provide greater surge protection for the substation apparatus than the other classes. The increasing size and cost of substation justify this increased protection.

3. Power transformer — capacity, winding connection, impedance, and voltages are several parameters to be considered in the choice of the substation transformer.

The capacity of transformers should be chosen on the basis of shovel loading and voltage regulation. The nature of shovel loading is such that substation kva capacity approaches 70 to 100% of connected horsepower for a single excavator. Where the large shovels or draglines are involved, the additional small loading shovels do not add appreciably to the loading.

Voltage regulation of the transformer improves with increasing transformer size for a given load. Transformer regulation is more significant for poor lagging power factor loads such as AC motor starting. It may be advantageous to use a larger transformer than is required thermally to keep starting voltage dips within tolerable limits. The extra capacity allows for additional loads not considered in initial planning.

Standard transformer impedances are tabulated as:

Primary Voltage, kv	Impedance, percent
115	8
67	7
34.4	6
22.9	5.5

A reduction in impedance of transformers to minimize voltage regulation involves additional cost at no increase in transformer capacity. Standard transformer impedances are usually used.

Winding connections—The modern trend is to the three-phase transformer. The use of single phase transformers is being abandoned due to additional cost, both initial and installation cost. Also, three-phase transformer substations are more easily relocated.

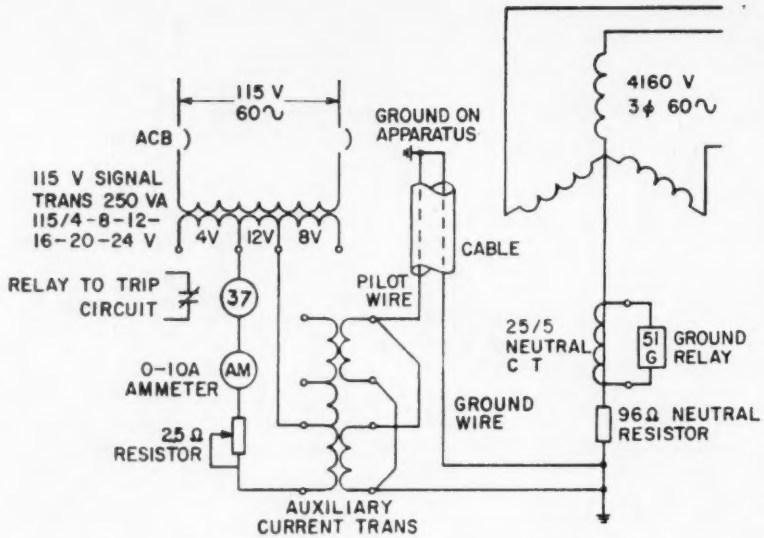


FIG. 3—**CABLE** monitoring scheme.

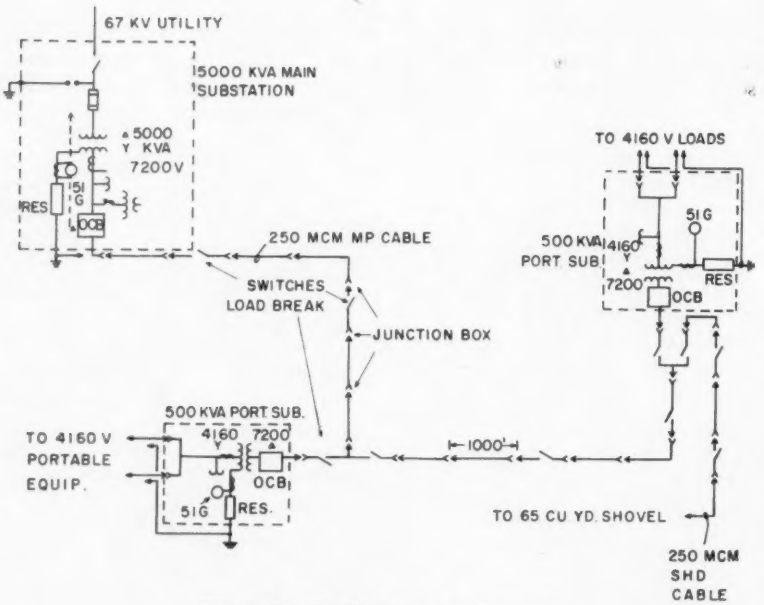


FIG. 4—**STRIP MINE** one-line diagram.

The substation transformer(s) should have a delta connected high-voltage winding and a wye connected low-voltage winding. The delta winding is required to stabilize the secondary neutral and to minimize third harmonic voltages. The wye secondary is required to have available a secondary neutral to safety neutral resistance ground the substation.

The primary voltage of the transformer is determined by the utility supply available. The secondary voltage choice is primarily dependent on voltage regulation, cost of associated equipment, and availability of equipment.

Until the advent of the 65-yd shovel, 4,160 and 2,400 V were the usual pit voltages. A few isolated cases used up to 6,000 V. The 65-yd shovel necessitated even a higher voltage to realize operating flexibility with cables which would not be too difficult to handle. Now, 115-cu yd shovels are being considered with horsepowers requiring full load currents in the order of 1,000 amp at 6,900 V. Here, multiple cables or large cables (over 500 MCM) need be considered to realize the thermal capacity and voltage regulation required. Larger cables are more difficult to handle.

The use of multiple cables to realize a given thermal capacity, reduces cable reactance. However, multiple cables increase the exposure to cable faults and require more couplers or splices to terminate cables. Both ends of a cable need be isolated to de-energize the cable.

In line with the trend to higher voltages necessitated by larger concentrated loads, the 13,800-V distribution system must also be seriously considered. Some problems which must be surmounted are (1) availability of collector systems and cable couplers for this voltage, (2) cost of cables and other equipment, (3) necessity of a dual voltage distribution system for the smaller loading shovels and increased care in handling and terminating cables required at the higher voltage.

The 13,800-V distribution system has long been used in industrial plants. Suitable transformers, switchgear, and motors for this voltage are available for the sizes being considered.

4. Neutral grounding resistor—The modern mine distribution system is safety resistance grounded. The use of the resistor has become more and more accepted as the safety advantages are more realized. Prior to 1933, the open pit mine was generally solidly grounded.

Criteria to be used when choosing a resistor are as follows: (1) Limit frame to ground voltage to 100-V maximum on single line to ground faults, considering the ground wire used to connect the portable equipment frames to earth; (2) Continuously rated and corrosion resistant, to continue to function in the event of relay or breaker failure; (3) Insulated for line to line voltage for insulation margin; (4) Allow sufficient fault current to be selectively relayed with adequate margin by the feeder breaker relays. A relaying margin as large as feasible is desirable—no less than 3:1 ratio of maximum fault current to relay pick-up current. A 5:1 ratio covers ground faults on 80% of the transformer and motor windings; (5) Allow sufficient fault current to at least equal the capacitive system current so as to minimize transient overvoltages.

This last consideration becomes more important as increasing voltages are used with long lengths of shielded cables. Capacitive currents of 5 amp per mi of cable may be realized, depending on voltage, type, and size of cable. Surge capacitors also contibute to the charging current.

Ground resistors of 25 to 75 amp have been successfully used in open pit mines. Fig. 2 shows the voltage and current to be expected during a single line to ground fault on the safety grounded system.

5. Main circuit breaker — The main factors to consider in the choice of circuit breakers are voltage rating, continuous current carrying capacity, interrupting capacity, and momentary capacity. Both air and oil circuit breakers are used in mining service. The trend in breakers has been more to the air breakers built into packaged substations. As with other substation components, the breaker sizes have been increasing to handle the increased fault and thermal capacities required. Only a single feeder is shown in Fig. 1. There could be more as required.

6. Grounding—The grounding of mine substations merits special consideration. Note that Fig. 1 shows the safety neutral resistor ground as separate from the main substation ground. This separation is to minimize the effects of primary ground faults and substation surges on the safety ground wire. A 50-ft minimum separation is recommended. Each ground should be a low resistance ground and a maximum of 2 ohms for the main substation ground and a maximum of 5 ohms for the safety ground. Lightning arresters and all substation equipment frames should tie to the main substation ground grid. Only the neutral resistor and safety ground wires tie to the safety ground grid.

7. Relaying—In the past, usually only overcurrent relaying was provided in the small single ended mine substations. With the increasing size, cost, and required reliability of present day substations, additional relaying and substation protection is considered. Inverse time induction disc relays serve for both phase and ground fault protection. Substation differential relays can quickly initiate the isolation of substation faults. A capacitor trip device enables accurate relay tripping and is not dependent on a potential source during fault conditions. Ground fault relaying is effective even during double line to ground faults. Relays with instantaneous trip attachments are used if there are no other breakers between the substation feeders and the equipment fed at the distribution voltage.

Transformer secondary and secondary bus line to ground faults must be cleared by opening a primary breaker, wherever it is located. When the primary breaker is located remote to the substation, tripping can be effected by transfer tripping or a primary grounding switch. In either case, two ground relays should be provided; one to trip the main secondary breaker on ground faults not cleared by the feeder breakers, the second one to trip the primary breaker by activating the primary switch or through a transfer trip scheme.

A recent trend to the increased use of ground wire monitor schemes, to isolate the system in the event of an open in the ground wire, has been noted. This additional safety measure is desirable, as the safety grounded system is ineffective if the ground wires to a portable machine are open. Fig. 3 shows a simple scheme used to continuously monitor ground wire continuity.

An alternating current of extremely low potential (12 V or less) is circulated over a cable pilot wire to the frame of the connected equipment, back to the ground point at the neutral resistor. Any open in the ground or pilot wires causes this current to cease flowing, deenergizing relay 37, which trips the circuit breaker. An ammeter indicates the circulating current; a resistor is used to adjust the current. The auxiliary current transformer isolates the monitoring equipment from the high voltage cable grounds. As shown, the monitor scheme will trip the breaker on loss of voltage. Where desired, a modification of the circuitry shown (connect relay 37 shunting the primary of the auxiliary current transformer) allows the breaker to stay closed on loss of voltage.

Distribution Trends

The trend to larger substations has been accompanied by the increased use of unit substations, completely packaged. Installation is easier and moves are facilitated. With increasing substation size, the double ended substation may be desirable for increased continuity as well as keeping individual transformers smaller in size.

A loop field has been used to feed from two (possibly three) substations, feeding each shovel load from at least two directions. This arrangement has the advantages of increased continuity, and better voltage regulation. The loop feed arrangement becomes increasingly attractive when substation sizes above 5,000 kva are involved as the larger substations are more difficult to move. Two or more smaller substations paralleled through cables provide additional flexibility in that the loads need not be as far from a power source at any one time. Substation moves are minimized. Duplication of smaller substation equipment minimizes spare capacity requirements.

Several precautions should be observed when considering parallel operation of substations. They must be designed for parallel operation, i.e., matched voltage, impedance, phase rotation, etc., so that loads will be shared. Cable impedance from each substation will add to the source impedance causing greater load to be carried by the substation nearest the load. Selective relaying is more complicated. And, the possibility of one or more ground sources exists depending on the number of paralleled substations. Feeder breaker short circuit capacity must be capable of handling the combined short circuit that all of the substations can deliver to a fault location. Operators must realize that both feeds to a circuit must be isolated to deenergize a piece of equipment.

Portable Substation

Where power from the main substation is fed to the large stripping shovel at 7,200 V, portable substations located in the pit may be required to derive a lower distribution voltage. This lower voltage may be desirable to feed existing equipment rated for a lower voltage, or equipment that is too small to be suitable for operation at the primary distribution voltage. Fig. 4 shows a one line diagram of a possible system for a large strip mine.

A 5,000-kva, 67 to 7.2 kv main substation supplied power at 7.2 kv

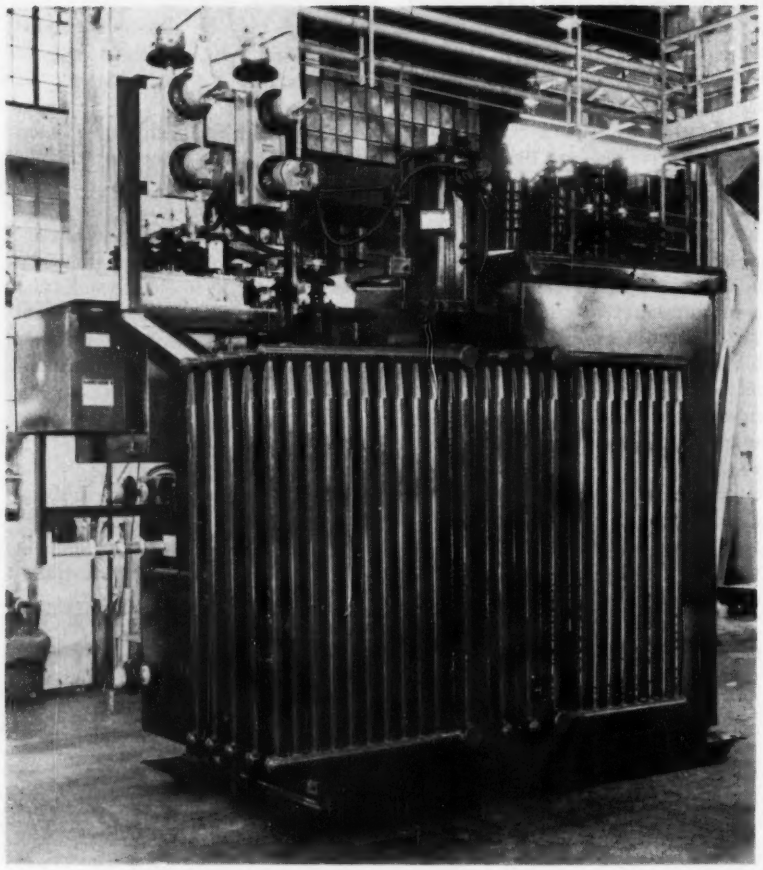


FIG. 5–PORTABLE strip-mine substation.

via cables to the large stripping shovel as well as to two 500 kva portable 7.2 to 4.16 kv substations for the loading shovel, drill, and auxiliary loads. Two portable substations can be used (depending on cable economics) to accommodate the drill and loader when widely separated, and also as standby capacity. The portable substation has essentially the same circuitry as the main substation.

A visible means of circuit isolation is required to enable isolation from the main plant substation. A circuit breaker, either primary or secondary, is desirable to isolate faults on the secondary circuit. A circuit breaker on the primary must have sufficient capacity to handle short circuits available from the main substation. However, a primary breaker can isolate ground faults which may occur in the substation itself, ahead of the secondary breaker. The need for fuses with the possibility of single phasing is eliminated when using a primary breaker.

A secondary breaker need only be rated to the voltage and capacity of the portable substation which is below the requirements of the main substation. Primary protection is required for the transformer in the portable substation where a secondary breaker is used. Then there is no local primary breaker and the transformer secondary netural is grounded through a safety resistor, means should be provided for tripping a remotely located breaker for transformer secondary line to ground faults. The cable ground wire monitor scheme, when used, can effect this remote tripping.

The portable substation transformer also should be wound delta primary wye secondary for the same reasons outlined for the main substation transformer. Capacity is chosen also on the same basis.

The neutral resistor for safety grounding also is required. However, if the primary feed to the substation is safety grounded, the neutral resistor safety ground need not be separate from the frame of the substation apparatus. It is still desirable to earth ground the portable substation frames to allow a low resistance discharge path for lightning arresters, and to keep the safety ground wire close to earth potential.

Fig. 5 shows a skid mounted package portable substation. Included is a primary gang-operated air insulated load break switch with power fuses, a delta primary wye secondary, 1,000 kva, three-phase power transformer, an electrically operated secondary oil circuit breaker, a safety neutral grounding resistor, an auxiliary transformer with primary fused cutouts, lightning arresters, metering, and protective relaying, including continuous monitoring of ground wire continuity. Another possibility which merits consideration for the pit using machines at different distribution voltages is the use of a shovel mounted transformer. This arrangement permits use of a single distribution voltage in the pit, obviating the need for the portable substations. Protection for the shovel mounted transformer is supplied by the switchhouses feeding the shovel. However, consideration should be given to the higher voltage collectors required on the shovel, and the loss of diversity when two or more loads are fed at the lower distribution voltage.

Portable Switchhouses

Portable switchhouses are available with and without circuit breakers to enable sectionalizing the mine distribution system.

Fig. 6 shows a portable switchhouse or "disconnect house" which includes a load break air insulated three-pole gang-operated disconnect switch. The wire glass window enables a visual indication of circuit isolation. For multiple feeds, units with two or more switches are available.

Load break switches are more desirable than non-load break switches from a safety standpoint. Also, the switch is capable of interrupting load current required when interlocking is defeated. Electric interlocking through the cable couplers on the disconnect house is effected with the cable ground wire monitor scheme.

The disconnect house has no means and is not rated to automatically isolate a fault. Thus, the disconnect house offers no circuit protection as such. Fig. 7 shows a portable switch-

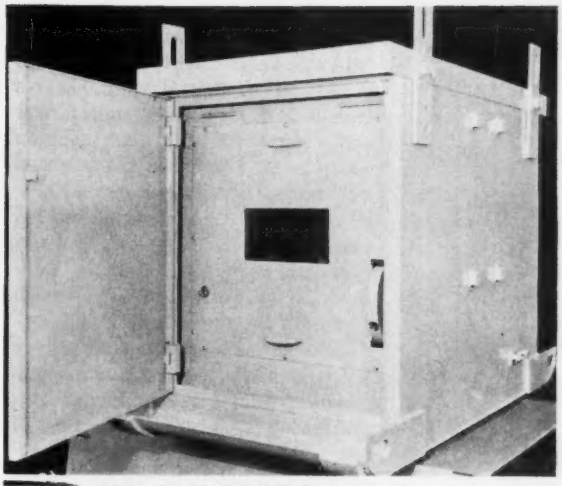


FIG. 6–PORTABLE disconnect house.

FIG. 7–PORTABLE switchhouse.

house housing an oil circuit breaker for the automatic isolation of faults. Switchhouses have been built with more than a single breaker for protection of multiple feeds.

Proper choice of relaying will enable some measure of cable and shovel protection on severe overloads as well as faults. Thus, it is desirable to use a breaker switchhouse for feeding each shovel where back-up protection will not offer suitable protection for the individual loads.

Fig. 8 shows a typical schematic of a single breaker switchhouse. The incoming cable from the power source at the distribution voltage level terminates either in the incoming line cable coupler or on the switchhouse bus.

A gang-operated disconnect switch serves as a visible means of circuit isolation. The switch blades are visible through a wired glass window in the switchhouse enclosure. Also, the switch is mechanically interlocked with the oil circuit breaker to prevent the operation of the switch under load.

A fused auxiliary transformer provides a source of low voltage power for a space heater–to minimize moisture condensation, and a capacitor trip device–to provide a source of tripping potential independent of line voltage during fault conditions. When used, the cable ground wire continuous monitor scheme is also supplied power from this auxiliary transformer.

Conventional phase current transformers energize induction disc protective relays to protect the circuit on phase faults. A balanced flux current transformer feeding into a sensitive ground fault relay provides protection on ground faults down as low as 5 amp. The oil circuit breaker, usually manually operated, enables the automatic isolation of faults.

Switchhouses are usually placed near the load and thus should isolate faults as soon as possible. Phase relays are chosen to ride over the accelerating inrush of the shovel and dragline m-g sets but still provide some measure of sustained overload protection. Instantaneous trip attachments should be used on the relays to immediately initiate the isolation of faults.

Outgoing cables either terminate in cable couplers or on the outgoing circuit bus. Where couplers are used, it is desirable to interlock the couplers either mechanically or electrically or both to prevent a workman from inadvertently disconnecting an energized cable coupler.

Portable Mine Power Centers

The trend in portable mine power centers is to the use of safety resistance grounding. Also, the use of balance flux ground fault relaying on individual feeder circuits is increasing. Both of these trends lead to increased safety by including the low

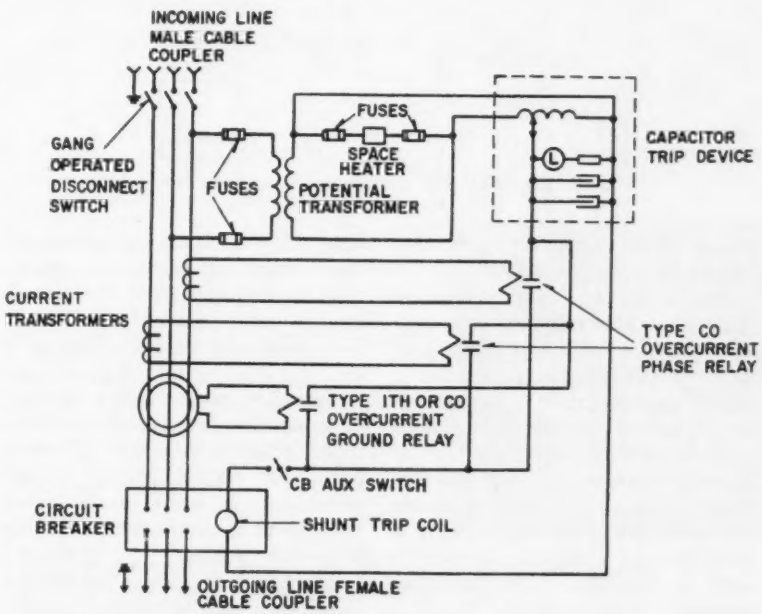


FIG. 8–SCHEMATIC of portable switchhouse.

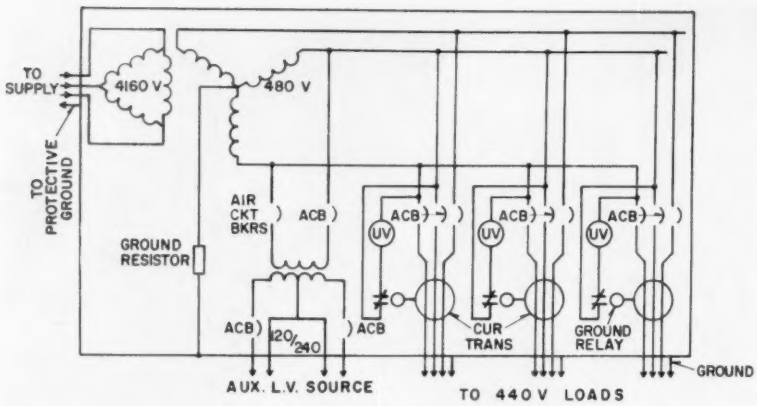


FIG. 9—MINE power-center schematic.

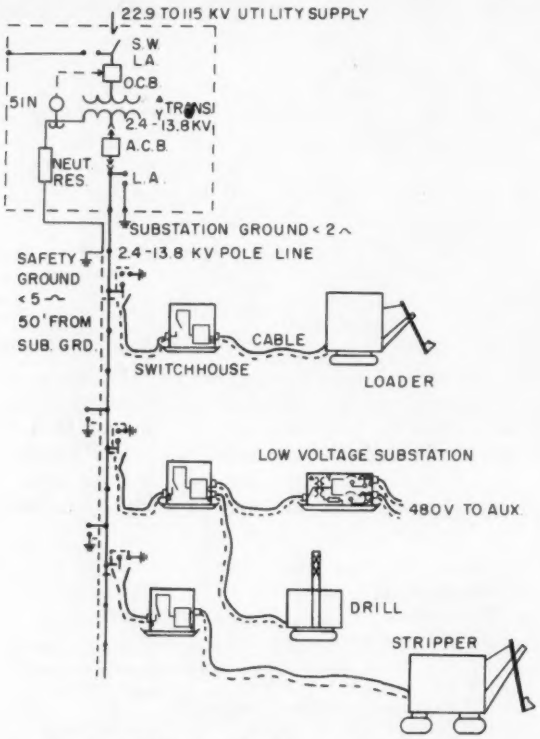


FIG. 10—OPEN PIT distribution using open line.

voltage system under the protection offered by safety grounding.

Fig. 9 shows a schematic for a mine power center for supplying auxiliary loads at utilization voltages of 600 V and below. The transformer is preferably delta primary, wye secondary connected for the same reasons outlined for the substations at the distribution voltages, i.e., to have a secondary neutral connection available for safety grounding and to have a delta winding to stabilize the neutral and to minimize third harmonic voltages.

The secondary neutral grounding resistor is also chosen on the basis of safe voltage and relaying considerations. Ground resistors of 25 amp and less are being used to keep machine frame-to-ground voltage below 15 V during ground faults. The power center neutral resistor is also continuously rated and constructed of corrosion resistant materials to insure continuous frame-to-ground voltage protection. A small single phase transformer is shown for a 120/240 V auxiliary source.

Three outgoing power circuits are shown each with an air circuit breaker. Each breaker has thermal and magnetic phase overcurrent protection and an undervoltage (or shunt trip) coil. Ground fault tripping down to 3½ amp is effected by means of a balanced flux current transformer and a sensitive ground fault relay on each circuit. The use of the balanced flux current transformer instead of a series ground trip coil in the molded case low voltage breaker entirely eliminates the false tripping and multiple ground path problems associated with the ground trip coil.

Also desirable in the low voltage power source is the continuous monitor of ground wire continuity. This monitoring is effected by a source of low voltage power and a monitor relay for each power circuit leaving the power center. As in the high voltage cable monitor scheme, a pilot wire is also required in the low voltage cable.

As with the portable substation at the distribution voltage, it is not necessary to provide a separate safety ground grid at the low voltage substation. The safety grounded system at the distribution voltage level limits the frame-to-ground voltage of the power center frame during primary ground faults.

Transmission Lines

The transmission of power from the main substation to the loads is extremely important in the design of the distribution system. Most of the voltage drop appearing in the system is as a result of transmission losses. To keep voltage within plus or minus 10% of machine rating during normal operation at the desired distances from the substations requires a well designed system. It is desirable to keep voltage during starting the large motors, usually the most severe system requirement, to within 80% of machine rating.

Overhead transmission lines are higher in impedance than cables of equivalent thermal capacity and thus result in greater voltage regulation. The trend is toward the use of cables only from the main substation to the portable loads to keep voltage drop to a minimum. This is especially the case with the larger excavators. Also, lightning exposure is minimized by the greater use of cable. Fig. 10 shows a mine one-line diagram, using open line transmission to the switchhouses. The use of cables instead of open line at the distribution voltage would improve voltage regulation.

FIG. 11—UNIT substation showing control cabinet.

Mine power cable, having shielded phase conductors and ground wires in the interstices is often used up to within 1,000 or 2,000 ft of the portable load. The trail cable of the portable machine is usually type SHD portable cable. The inclusion of a pilot wire (rated for mechanial as well as electrical strength) is desirable in the above cables to enable the continuous monitoring of ground wire continuity.

Cable couplers have met increased acceptance in both the pit and underground mine. The trend has been toward the greater use of multi-conductor cable couplers. This type is presently available up to 300 amp at 7,500 V. However, the increasing size of shovels and draglines may require increased thermal capacity as well as voltage ratings in cable couplers with multiple conductors.

Lightning Protection

Lightning protection is most effective when applied close to the apparatus to be protected. Equipment connected by cable to an exposed source or directly to an exposed source generally requires lightning protection. Protection against lightning is usually provided at the outdoor substation by station class lightning arresters and overhead ground wires. The portable substations, energized through cables from exposed sources usually should have arrester protection at both ends of the cable.

Rotating machines have lower impulse levels than liquid-filled transformers, switchgear, etc. Thus, it is recommended that all rotating machines connected to exposed circuits be protected by rotating machine arresters and surge protective capacitors at or very near to the machine terminals. Even though the pit loads are not connected directly to exposed lines, it is still desirable to use arresters and surge capacitor to reduce the effects of induced lightning and switching surges. In addition, an arrester at each cable tap-off point on the open line, and approximately 1,500 ft from the tap-off point is desirable for increased protection. Arresters for the resistance grounded systems used in the open pit mines are rated for line-to-line voltage.

The continuous satisfactory operation of the modern open pit mine depends heavily upon the power distribution system. A careful selection of the distribution apparatus is an economic necessity. The small additional expense for the safety features available, the margin of capacity and the good voltage regulation designed into the distribution system is easily justified by safety and dependability.

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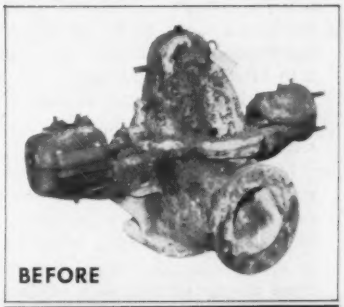

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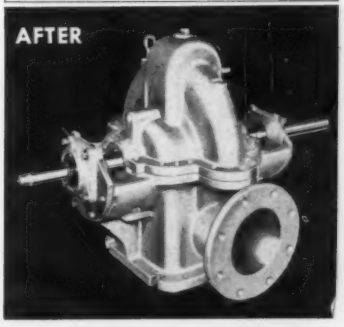

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New Mining Developments Serve Safety and Efficiency in Coal

Program highlights at 74th annual meeting of Coal Mining Institute of America include discussions of roof shields and jacks, better supply handling, progress in dust collection and foam-plug firefighting experience.

OTHER FEATURES of the 74th CMIA program were a resume of USBM research activities by Director Marling J. Ankeny of the Bureau, a discussion of factors involved in productivity prepared by E. G. Fox of BCOA and reports on float-dust and trailing cable hazards, maintenance of continuous miners and fire-resistant hydraulic fluids.

At the business session which opened the two-day meeting at Pittsburgh, Pa., Dec. 15-16, W. Dan Walker, district supervisor, Health and Safety, U. S. Bureau of Mines, Pittsburgh, was elected to the presidency of CMIA, succeeding W. E. Hess, manager of mines, Jones & Laughlin Steel Corp., California, Pa. Newly-elected first, second and third vice presidents are, respectively, Jesse F. Core, vice president—coal operations, U. S. Steel Corp., Pittsburgh; R. H. Jamison Jr., president, Delmont Fuel Co., Hunkers, Pa., and K. W. Bartlett, general superintendent, Ellsworth Div., Bethlehem Mines Corp., Ellsworth, Pa. J. M. Lowe, chief accountant, Emerald Coal & Coke Co., Pittsburgh, was reelected secretary-treasurer.

Mr. Lowe reported further gains in membership and net worth of the oldest coal mining institute in the nation. J. W. Hunt, of the continuing education staff of the College of Mineral Industries at Penn State, and chairman of the Institute's education committee, reported the successful initiation of a work-study program at Penn State, in which students spend half time on the campus and half at a job in industry. Two sponsored students share the job in industry, one working while the other attends college. The program offers a mining degree in 5 yr, with 2 yr experience gained in the meantime.

Following are abstracts of speeches and technical papers at technical sessions conducted by Messrs. Walker, Core and Jamison:

Significance of Bureau of Mines Research to the Coal-Mining Industry, Marling J. Ankeny, director, U. S. Bureau of Mines, Washington, D. C.

INDUSTRY MEETING—
A Special COAL AGE Staff-Written Report

The Bureau's total operating appropriation for the fiscal year beginning July 1, 1960, and ending June 30, 1961, is approximately $30 million. Included are approximately $11.4 million for research and development on minerals and metals and $2.8 million for petroleum and natural gas. Funds amounting to $6.3 million are devoted to research and development for bituminous coal and lignite; $0.7 million for anthracite, and $1.2 million for the Bureau's Health and Safety Research and Testing Center. In addition, $4 million of cooperative research funds are contributed to the Bureau for research and investigations.

In explosion- and fire-prevention research, a recent promising development is a small high-expansion foam generator to which is attached 100 ft or more of rolled-up light plastic tubing. The generator can be easily transported to the scene of a fire, where the pressure developed by the generator will unroll the tubing, thus directing the foam to the fire virtually by remote control.

The Bureau is reviving interest in better visibility in working places and has developed new types of fluorescent fixtures that indicate improved lighting efficiency at reduced overall cost.

Another important development is the miniature methane detector, small enough to fit in one's shirt pocket, operated by one standard flashlight cell. Research into the control and support of mine roof strata continues, including experimental work with a penetrometer, a device for determining the relative hardness of rock at anchorage points for roof bolts.

Concerning the future of the Pittsburgh station of the Bureau at 4800 Forbes Ave., legislation was introduced in the last Congress that would have authorized the sale of the Pittsburgh plant to nearby Carnegie Tech in the Schenley Park area.

Department of the Interior favored the proposed legislation, providing it was amended to authorize relocation of the Forbes Ave. plant. The last Congress did not act on the matter, but it is not unlikely that it will be introduced in the new Congress which convenes this month. It should be emphasized that present plans are not firm and the facilities on Forbes Ave. cannot be given up until other suitable quarters are provided.

Productivity, Edward G. Fox, president, Bituminous Coal Operators' Association, Washington, D. C.

Industrial productivity is most commonly measured in terms of an index of output per production worker per man hour, a definition that may be further complicated by whether the man hours are "worked" or "paid for." This is a misleading definition. The greatest productivity increases of the past 15 yr have been due almost entirely to capital investment and management ingenuity—not to any increased effort on the part of employees and only slightly to increased skill requirements.

Note that all sorts of factors, even if relatively minor to capital investment or labor effort, play their part. Climate, for instance. Air conditioning may make an Alabama textile worker as productive as his Maine coworker, but it takes capital investment to do it. Does true productivity in the Alabama mill then compare with that of the Maine mill without some explanation of the capital investment that made them comparable?

We can trace the flowering of the output-per-man-hour concept back to the late Forties and early Fifties when labor unions were casting for new justifications for wage increases. After the depression of the Thirties labor rebuilt and grew on demands for a "living wage." Then came the drive for fringe benefits, also tied to "increased productivity per man-hour" as justification.

General Electric defines productivity as "the efficiency with which goods and services are produced in the ratio of output of goods and services to the input of resources." Few economists make any effort to put this definition to use.

Measures of productivity are estimates indicating general trends. Comparisons between and within industries are of doubtful validity. The range of products is too wide and the rates of technological advance differ. The ratio of real output

to total capital and labor input must be accounted for.

Coal has had a good post-war productivity record, but other industries also have made substantial gains. In coal there was no other answer to survival. Wartime overdevelopment of crude oil reserves and the entry of natural gas into an already highly-competitive fuel market, plus increases in coal's wage rates, led to more drastic changes in production methods than had ever been dreamed. Mechanization was the answer—not only the continuous miner below ground but the giant stripping shovel above. These required huge capital investment and more management ingenuity than the industry had ever developed before. It also demanded a labor union that would recognize its own survival was dependent upon a cooperative effort to keep the industry alive.

Coal received the investment, the inventions, the improved methods and the cooperation of the union. So today the industry is alive with a well-established and improving position in the fuel market. But productivity must continue to improve to keep this position, even though all the "easy gains" have been made.

Unemployment among miners is regrettable. Some may come back to work in time and others find employment in other industries in a growing economy. The government's function is to help through unemployment benefits and retraining programs.

Use of the Movable Shield as Protection From Falls in Face Areas, James T. Jones, assistant superintendent, Mather Collieries, Pickands Mather & Co., Mather, Pa.

The Dowty-Rodjo shield is a mobile, temporary roof support, actuated by hydraulic jacks, used for the protection of men and equipment in the face area. The shield used in the tests at Mather is a prototype and as a result of the tests the manufacturer is making some indicated changes in design in models soon to be offered for sale. The roof-support unit consists of seven I-beams, four in one unit and three in another. The units are interlaced and each is supported on jacks. The two structures are connected by two hydraulic rams which pull or push one unit relative to the other. Independent control of the rams permits steering of the shield as it advances or retreats. Each unit is capable of maintaining support of the roof while the other moves.

The shield must be connected to an outside source of hydraulic supply, a continuous miner or roof-drilling machine, for example. Working pressure is 500 psi and each jack exerts a force of 3 tons against the roof. The beams are 15 ft long and the width of the shield is adjustable from a minimum of 11 ft to a maximum of 14 ft 3 in, overall.

In the beginning an effort was made to develop a roof-bolting device that could be attached to shield so that the roof could be bolted at the same time that the continuous miner was operating under it. This would permit continuous advance of the working place to its limit without moving the miner from one place to another. Some progress was made, but after a time the effort was concentrated on adapting the shield to the present cycle of mining, taking advantage of the 39-ft cut that can be taken with the roof shield as compared to the 16-ft cut which is standard practice with the Lee-Norse Miner at Mather.

The shield has been used both in development and in pillaring, satisfactorily fulfilling its function as a mobile, temporary roof support.

Some provision must be made for increasing the possible vertical movement of the shield and for hydraulically-controlled contraction in width, both for greater mobility. Once these problems are worked out the shields could be used to advantage in many mines employing continuous miners. On each working section at least two and probably three shields would be needed. Tentative price on these shields has been set at $8,000 each.

An important prospect is that mining systems could be worked out that would greatly reduce the amount of roof bolts or timbers used in rib extraction as a result of the longer cut the shield makes possible. Another possibility is the development of rooms on 46-ft centers so that the pillar between could be extracted through the use of the shield without any bolting or timbering. If 95% overall recovery were achieved 54% of the area mined could be taken without bolting or timbering.

Recovering Pillars With Continuous Miners (Emphasis on Use of Hydraulic Jacks), Wayne D. Snell, chief mine inspector, Frick Dist., U. S. Steel Corp., Uniontown, Pa.

Complete dependence cannot be placed on roof bolts in pillaring with miners since experience has shown that other devices are needed to give warning when the roof begins to take weight.

Experiments with yielding-type hydraulic jacks began in the Frick district about 3 yr ago and their original use in lieu of cribs has been expanded until they are now used in place of posts in the extraction of wing lifts with boring-type machines. It has been the practice in the Frick district to pull main roof supports to promote the free-breaking of roof strata and retard the projection of weight on pillars in advance of the fracture line. The cost of crib blocks—and hydraulic jacks—makes it imperative that both be recovered.

Time studies show that the combined time of two men, plus a shuttle-car operator, adds up to 24.17 min to extract a crib; whereas the combined time of two men to extract a hydraulic jack is 1.25 min. It is computed that the two men were exposed to the possibility of a roof fall a total combined time of 12.5 min to attach the rope to pull the crib and to recover the crib blocks. In addition, 25% of the crib blocks are not recovered.

In comparison, the men extracting the hydraulic jack have no exposure time to a possible roof fall since the pull rope is placed in position when the jack is installed. They stand back out of the fall area and simply pull the rope to release the hydraulic pressure and drag the jack out of the fall area.

The jacks presently in use weigh 136 lb and will support up to 21 tons before yielding begins. Maximum weight-bearing strength per jack is approximately 50 tons before damage to the jack takes place. The jacks also serve as an audible warning device since a hissing sound can be heard to a distance of 30-40 ft as yielding takes place. And the yielding action is visible.

A new type hydraulic jack has been ordered. These weigh 50 lb and begin to yield at a load of 8 tons. These will take the place of temporary posts which are installed until roof bolting is completed. The method is used in the multiple-pass openings worked by ripper-type machines.

Through-Steel Dust Collection for Roof Bolters on Continuous Miners, Walter R. Weaver, mining industrial engineer, Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp., California, Pa.

The solution of one coal-production problem requires a new or different approach to an old one. In the case of miner-mounted roof-bolting drills the problem is that of dust collection.

Where roof bolting is done by a separate piece of equipment, as in conventional mining, adaquate dust collection systems have been available for some time. Space limitations complicate the matter in continuous mining. Furthermore, the drills must be mounted in a manner that will not slow down the production operation and a means of creating the necessary vacuum for dust collection must be provided. The Joy 1-CM machines at J&L are equipped with the system made available by Mine Safety Appliances Co.

Two Roots-Connersville vacuum pumps, providing a negative pressure of 11 in of mercury, are driven through V-belts by the 26-hp pump motor which power the roof drills. Cost of the installation per machine is approximately $1,500, a small investment considering the improvement in environment. There has been excessive breakage in hollow drill stems and some other parts, but

these bugs are being worked out through redesign of the parts. Some of the breakage is due to the "rocking" of the machines on uneven bottom while the rods are in the roof holes.

Research on Float Dust Hazards, by John Nagy, chief, Branch of Dust Explosions, and Donald W. Mitchell, chief, Mine Experiments Section, Health and Safety Research and Testing Center, U. S. Bureau of Mines, Pittsburgh.

Conclusions drawn from current tests in the Bureau's experimental mine at Bruceton, Pa., indicate that float-coal dust deposits present an explosion hazard if preventive measures are not taken. The hazard can be neutralized by generalized rockdusting. Current research indicates that an incombustible content of 80% is required. The increase in incombustible from the minimum 65% specified in the Federal Mine Safety Code to 80% is due primarily to the fineness of the float coal dust. The 80% incombustible in mine dust in return airways where float coal is deposited must be maintained in the rib and roof dust as well as in the floor dust. Previous research has shown that heavy "blanket" rock dust deposits on the floor, with even as much as 95% incombustible, do not compensate for a deficiency in incombustible in rib-roof dust.

Research is being conducted on methods for trapping the airborne dust. One obvious solution is to prevent dissemination of the dust from the face; however, present methods are not adequate or they interfere with face operations. Consideration is being given to the use of foam, the continuous dispersion of rock dust, and the binding of the dust to the mine rib and roof surfaces to prevent dispersion in the event of an explosion. Further explosion tests are being conducted to provide more detailed information on the float dust hazard and on stratified layers.

Daily Maintenance and Complete Overhaul of Continuous Miners, Fred R. Hilderbrand, supervisor of maintenance, National Mines Corp., Isabella, Pa.

Within two days after receiving a continuous miner at the central shop for overhauling a 3-man crew working one shift a day will have the machine disassembled and the rebuilding of the main frame begun. Electrical, hydraulic and mechanical components at this point have been sent to appropriate departments of the central shop for rebuilding. Many mechanical alterations can be made to strengthen the machine structure, as may be dictated by local conditions.

Special steels are used at points of high abrasion or fatigue. Bolted frame sections are welded into single units wherever possible. Sprocket rims of high strength steel are installed on crawler chain drives and idlers.

During the rebuilding operation a number of alterations are made in hydraulic and electrical systems to facilitate future maintenance when the machine returns to service. These alterations are made on the strength of the maintenance history of the machine and the recommendations of mine supervisors and maintenance men.

One large company maintains a bearing test center wherein the condition of new or used bearings is determined by instrument rather than by opinion. One of the results of this is that used bearings are sometimes returned to service. In checking a stock of new bearings it was found that slightly more than 11% had some imperfection. The formation of such a test center in a large corporation could lead to substantial savings.

Equipment-Mounted Fans in Low-Coal Areas, Thomas E. Jones, inspector, Pennsylvania Dept. of Mines and Mineral Industries, Beaverdale, Pa.

A number of types of auxiliary fans with differing arrangements of ducting to carry the air to the immediate face were tested at Lancashire No. 15 mine of the Barnes & Tucker Co. by authority of a commission of state mine inspectors. The most successful of those applied was driven by a 2-hp electric motor at a speed of 3,400 rpm. The fan and motor were installed under the tail of the 76-AM Colmol at a distance of 21 ft 9 in from the cutting head. Air is conducted through a 6x8-in duct to a "Y" at the head end. Legs of the Y lead to outlet pipes along the top of the cutting head and to an outlet on the left side of the machine near the cutting arms. Quantity of air discharged at the top is 304 cfm and at the bottom 269 cfm. With the line brattice back 25 ft from the face and with 4,550 cfm passing the end of the brattice this fan kept methane content at less than 1%. With the fan stopped methane content built up 4.5% on the right side of the machine while the fourth shuttle car was loaded.

Barnes & Tucker officials plan a further test using a fan driven by a 7½-hp motor at 6,000 rpm and delivering 1,600 cfm. The air will be delivered to the head of the machine through a 3x11-in duct.

The commission of mine inspectors then provided a list of recommendations to guide these applications of auxiliary fans.

Package Handling of Mine Supplies, James L. Tenley, chief engineer, Delmont Fuel Co., Hunkers, Pa.

Mine No. 10-B, operating in the Upper Freeport seam in Westmoreland County, Pa., employs conventional face methods, Long "Full-Dimension" section transportation and belt-conveyor main transportation. A supply track parallels the main belt and is extended to within 300 ft of the production faces. Men and supplies are transported on the track system, and supplies are hauled from the end of the track to the face by battery-powered, rubber-tired tractors and low trailers. Roof bolts are received from the supplier in strapped bundles, rock dust is bagged, concrete blocks are palletized and other supplies are similarly packaged.

The rubber-tired trailers are 4 ft wide and the flat cars on track are 20 ft long. Thus four supply trailers can be placed side by side on a flat car to be hauled to the end of the track. A ramp made from channel sections is used to run the trailers to the mine bottom from the flat cars. The tractor then hauls the supplies to the face. Four trailer loads of supplies are sufficient for 40 cuts of coal 25 ft wide by 10½ ft deep. A fork-lift truck on the surface handles the palletized supplies, removing them from delivery trucks and storing them in a lean-to for later loading on the supply trailers.

Three of the rubber-tired trailers have been converted for permanent duty, one carrying a 550-V welding machine, another fitted with the mechanic's tool box and maintenance supplies and the third as an explosives wagon. Move-ups are made at 120-ft intervals and these three cars facilitate the advance. Loaded supply trailers usually are low enough to be hauled under the bridge conveyors at the face.

Bulk Handling of Rock Dust, V. D. Hanson, chief mechanical engineer, Pittsburgh Coal Co., Div. of Consolidation Coal Co., Library, Pa.

Montour No. 4 mine, Pittsburgh Coal Co., now uses a bulk car which transports 14-ton loads of rock dust into the mine to the point where the dust is transferred into the MSA Airslide distributor. Bulk rock dust has been loaded into the car from Airslide trucks, conveyor trucks and plain dump trucks. It requires 3 min to unload a dump truck with a minimum of dust. The other types require from 12 to 20 min.

The present bulk car has its own blower and motor for activating the air. Further study may show the desirability of having bulk cars without their own air supply, since aeration requires only 1 psig.

Three schemes have been developed for handling rockdust ahead of the bulk car. Two of these involve a 20-ton receiving hopper into which dump trucks discharge. The bottom is equipped with air float conveyors discharging to an elevator which loads an elevated 100-ton bin. The 20-ton hopper and elevator can be eliminated if the supplier uses Airslide delivery trucks. The bulk cars load from beneath the 100-ton bin.

The third scheme is a 100-ton concrete bin built 4 ft into the ground and 4 ft above with airfloat conveyors at the

bottom to discharge to a borehole. Bulk cars would be loaded in the mine. Since all hoppers above would be filled by the supplier no company employee would be needed except to fill the bulk car. The ultimate is a one-man rockdusting crew with no loss in application rate.

Fire-Resistant Hydraulic Fluid: Technical Services of the Manufacturers Provide for Immediate Practical Application, Arthur W. Yoder, district chief engineer, Mobil Oil Co., McKees Rocks, Pa.

The lubrication engineer brings the services of the laboratory to the coal-mining industry. Pumps, filter contamination, valves, water for makeup and samples of fluids are analyzed as needed. Advice on pH of fluid and type and amount of sediment, if any, will act as a guide on service life, regulating oil change and makeup. Laboratory data on water at the mine can assure that mixing with such water will not affect emulsifiers or stability of the emulsion.

Cavitation in an oil-starved pump can result in damage to the pump. The lubrication engineer is trained to spot and analyze pump suction lines, hose lengths and diameters, possible suction screen restrictions and negative head conditions. He will measure pump suction vacuum in inches of mercury and will recommend changes that will provide suitable vacuum. Sometimes replacement of an old hose by a new one of the same size can reduce the vacuum by as much as 20%. Vacuum that is too high is not desirable.

High pressures have no detrimental effect on the stability of water-in-oil emulsions, but temperatures must be watched as an indication of loss of water as vapor. New fluid will range from 40% to 43% water; maintaining fire resistance requires that at least 35% water is present in the fluid. In this regard, car-spotters appear to warrant closer attention than any other coal-mine hydraulic units. Other machines have presented no make-up problems.

In making up, add drinkable water to the reservoir at a rate of 10% of pump gpm, that is, with a 50-gpm pump add 5 gal of water in 1 min.

Trailing Cables: No. 1 Fire Hazard Underground, Clyde L. Brown, mining engineer (electrical), U. S. Bureau of Mines, Pittsburgh, Pa.

Important features of an effective program for trailing-cable maintenance—a vital step in mine fire prevention—are as follows:

1. Avoid misapplication of cables; select cables of correct size and type.
2. Take necessary precautions to prevent mechanical damage to cables.
3. Avoid excessive lengths of cable. The longer the cable the more difficult it is to protect it from short circuits.
4. Provide the best short-circuit protection available (this is an incorrect application for fuses) and follow up with proper maintenance of protective devices.
5. Maintain good voltage regulation throughout the power-distribution system.
6. Keep machines free of extraneous oil and grease to prevent propagation.
7. Deenergize all trailing cables at the end of each working shift.
8. Do not operate machines with cable reeled where this can be avoided. Cables for shuttle cars should be adjusted at the anchor point so that a minimum amount of cable is retained on the reel with the car in operation. Excess cable should not be coiled tightly but stored in a manner to allow heat dissipation.
9. Isolate cable reels from machines by installation of fire barriers where feasible.
10. Encourage proper care of cables and respect for the hazards.
11. Adopt uniform splicing procedures and consider use of a cable-repair car.
12. Adopt standardized methods for making all cable repairs and maintain tools and supplies for making emergency repairs.
13. Establish a rigid cable-maintenance program.

High-Expansion Foam Plug—A Practical Instrument for Fighting Underground Fire, J. C. Olzer, safety director, Ireland mine, Hanna Coal Co., Moundsville, W. Va.

Ireland mine has cut down a mine car to carry Hi-Ex foam generating equipment. The car is fitted with a 500-gal aluminum tank for the foam chemical, materials to build the necessary brattice around the screen of the foam unit and tools and supplies. The materials are arranged so that the generator may remain on the car while in use.

In a recent unannounced fire drill at Ireland the supervisors, on an idle day, reached the scene of a simulated fire a mile underground in 10 min. They took with them the water car, fire material car and foam generator car. Within 12 min from the time of the announcement water was played on the fire. Within 20 min after the fire was reached the stopping was built and the generator was started. Regular fire drills are as important as good equipment.

The foam plug is another instrument, just as the water car and fire hose, rock dust and the distributor. Perhaps the most important aspect is that of deciding how the foam plug is to be used. Each fire presents a different set of conditions and it is the problem of the person in charge to evaluate the situation and choose the plan most likely to succeed.

It remains, however, that trial runs are necessary in building an effective fire-fighting organization. These exercises point out the flaws in organization and equipment. In some drills it was found that the water car was frozen, or that failure to wash the proportioning pump after use stuck the foam generator. Confronted with situations like this, corrective measures can be immediately formulated and written into the plan.

Use of High-Expansion Foam on an Actual Mine Fire, C. William Parisi, director of safety, Pittsburgh Coal Co., Div. of Consolidation Coal Co., Library, Pa.

On June 10, 1960, a fire of undetermined origin occurred at Montour No. 4 mine. The fire was fought directly with water from about 11:30 A.M. until 9:00 P.M., at which time the foam generator was placed in service. Canvas checks were erected across breakthroughs to parallel entries to direct the foam onto the fire. Soon after the foam unit was started the concentration of combustible gases returning from the fire area steadily reduced.

It was noted later that the fire was moving toward a mined-out area. The foam generator was relocated to place foam in the threatened area and it was effective. The foam extinguished open fires but it was unable to extinguish the fires beneath the roof falls that occurred.

Sealing became necessary, and the foam generator was used intermittently throughout the sealing operation to reduce the heat from the fire and to prevent buildup of combustible gases.

In summary, the foam unit can be placed in service in a relatively short time and it can be easily relocated. The percentage of combustible gases is substantially reduced by the foam. Had it not been for the foam plug it is possible that the fire would have spread into the mined-out area, thereby endangering a large portion of the mine. There is some question as to its effectiveness on deep-seated fires under roof falls. Further study of this will be possible when the sealed area is opened. Approximately three barrels of foaming agent is consumed for each hour of continuous operation of the generator. The process requires approximately 85 gpm of water. The foam plug is not a panacea. However, it does make an important contribution.

Our company became interested in this new method of controlling mine fires which was first researched and announced by the Safety in Mines Research Establishment, Buxton, England. Adaptations to American mining conditions were made by the U. S. Bureau of Mines. When Foamex, Inc., developed a packaged unit we obtained one to use in tests inside one of our mines. The tests results were impressive, leading us to purchase one of the generators. The generator represents another way of delivering water to a fire underground.

Foremen's Forum

A National Balance Sheet

	Billions of Dollars		
	1959	1960e	1961e
Exports of goods	−16.2	19.1	19.9
Imports of goods	−15.3	−15.1	−15.3
Trade Surplus	0.9	4.0	4.6
Services rendered to Foreigners	7.2	7.3	7.5
Services purchased from Foreigners	− 5.9	− 6.4	− 6.6
Services Surplus	1.3	0.9	0.9
Private Capital Outflow from U. S.	− 2.3	− 2.8	− 3.0
Private Capital Inflow to U. S.	0.5	0.7	0.6
Private Capital Deficit	− 1.8	− 2.1	− 2.4
U. S. Government Loans and Transfers:			
Military Expenditures Overseas	− 3.1	− 2.9	− 2.4
Economic Grants Overseas	− 1.6	− 1.7	− 1.8
Loans and Credits (net)	− 0.4	− 1.1	− 1.1
Deficit on Government Transactions	− 5.1	− 5.7	− 5.3
Unrecorded payments (errors and omissions)	0.8	0.7	0.5
Balance of Payments Deficit	− 3.9	− 3.6	− 2.7

e: Estimated.

The Flow of Gold

The "balance of payments," a headline making issue now facing the nation, is a matter of concern to each citizen. Here is an explanation of what it is—and what can be done to ease the pressure.

A FEW DAYS HENCE the inauguration of President-Elect John F. Kennedy takes place in the nation's capital, immediately projecting the new President into a number of heavy problems. Included are the problems associated with distressed areas, aid to education, the present business climate and other pressing domestic issues. Another matter that will be of immediate concern is the "flow of gold," which as you know is getting a lion's share of the headlines. Each of us is involved in this.

The following is an analysis by the McGraw-Hill Economics Dept. of the "balance of payments" issue—what it is, what is happening now, what may be the outcome.

"The gold price gyrations a few weeks ago, the fear that American products are being priced out of the market, the concern over U.S. monetary reserves and President Eisenhower's orders to reduce government spending overseas, all highlight the importance of our international transactions. If we can balance payments or even cut the deficit to manageable proportions, confidence in the dollar will be greatly strengthened.

"And we are on the way. The 1960 record shows an improvement over 1959, and further gains are predicted for 1961.

"Our balance of payments, or the sum of our international transactions, is a set of accounts similar to a company's consolidated income statement or the government's budget. In both cases, income is balanced against outgo. Exact balance is not often achieved, but this does not matter as long as surpluses and deficits offset each other in the longer-run. However, our balance of payments has run a deficit every year since 1950 except during the 1957 Suez crisis, and in the last couple of years the deficit has been too large for comfort.

"The accompanying table shows the U.S. balance of payments of 1959-60. This report presents a simplified explanation of what has been happening and our estimate of the trend for 1961.

Exports and Imports

"This year, U.S. commercial exports—all non-military goods sold overseas—have improved more than any other sector of our balance of payments; they are now 22% higher than a year ago. Since imports have declined slightly, the trade surplus this year will be $4 billion, more than four times greater than 1959.

"What accounts for this large trade surplus? In part it is the result of several special circumstances. For example, exports of commercial aircraft were cut drastically last year when aircraft manufacturers were switching from piston to jet engines. Now, the export sales volume of American jets is almost five times greater than a year ago.

"In addition, raw cotton exports are now more than tripled. The major reason is this: Last year, the U. S. Department of Agriculture, which pays exporters a subsidy on cotton sold abroad, announced that it was raising export subsidies in 1960. This led cotton exporters to defer 1959 sales until 1960 when the higher payments became available.

"Jet aircraft and raw cotton alone account for more than a third of the current improvement in U. S. exports. But these were exceptional circumstances, not likely to continue beyond this year.

"Higher steel exports have also contributed to this year's trade surplus. Steel exports, off considerably last year because of the strike, are now 54% above 1959 and are likely to continue at a high rate. American cars are also getting a better reception overseas, now that all the car makers are turning out a full range of compacts. Moreover, without resort to import restrictions, U. S. imports of foreign cars have declined, a development as important to the balance of trade as rising exports. A rising trend is also evident for machinery exports: the McGraw-Hill Index of Foreign New Orders, an indicator of future nonelectrical machinery exports, is currently 25% above the level of a year ago.

"Underlying these improvements in our balance of trade is the European eco-

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MSA illumination products include miners' Edison electric cap lamps, permissible trip lamps and fluorescent mine lighting systems. Automatic lamp charging equipment is supplied for self-service lamphouse installations.

Contact your MSA representative for additional information. Or, write Mine Safety Appliances Company, 201 N. Braddock Ave., Pittsburgh 8, Pa. In Canada: Mine Safety Appliances Company of Canada Ltd., 500 MacPherson Ave., Toronto 4, Ont.

nomic boom. It has created labor shortages and rising prices there, encouraging businessmen to buy more U. S. goods. Many countries in Europe have eased and even abolished import restrictions against American goods. As much as 15% of the rising U. S. trade surplus this year may be attributed to trade liberalization in Western Europe. Further gains may well be achieved in future years if the current tariff negotiations in Geneva, under the auspices of GATT (General Agreement on Tariffs and Trade), succeed in reducing the proposed tariff of the Common Market against our exports. Finally, European wage levels have risen and delivery times for machine tools and other heavy equipment have lengthened so that, by contrast, American products are now more competitive.

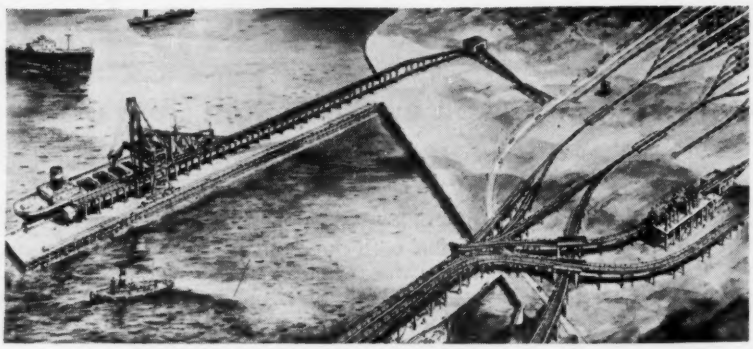
"So far, the increased flow of U. S. exports has gone almost wholly to Europe, because Canada and Latin America—traditionally this country's major foreign customers—have been in a recession. But the European boom may spill over into other continents—especially to the underdeveloped countries – and enable them, too, to shop more in the U. S. For several months this summer, it was feared that a policy of high interest rates in Germany and Britain would kill off the boom. But the monetary authorities there have just lowered their bank rates, encouraging continued investment abroad and improving the prospects for continued high demand for goods in their own countries in 1961. These are steps in the right direction, both for the U. S. balance of payments and for the stability of the world economy next year.

International Service Transactions

"On the whole, we have a favorable balance in the "services" sector of the balance of payments—earnings of capital abroad and payments for foreign travel and transportation. The return on U.S. investment overseas, the single largest item in the services account, is increasing. American holders of foreign bonds and equities are receiving a higher rate of return, while interest payments by Americans to foreigners are declining in step with the lower interest rate in this country during the past year.

"Partially offsetting this gain is a loss from travel expenditures. More and more Americans are traveling overseas for business and vacations, and they are using more foreign transportation facilities. Rising expenditures of foreign visitors here have not yet significantly cut this loss because they have been so small.

"We should continue to have a surplus of nearly $1 billion in the services sector next year. The return on our growing overseas investment may be expected to rise. Also, U.S. transportation firms expect to handle a larger share of the transportation of goods and travelers into and out of the U.S. And next year may see the first significant gain in foreign tourists' expenditures in America.



EXPORT of quality coal improves balance of payments.

International Capital Flows

"Private capital transactions affect our balance of payments much like the trade flows do: foreign investment by Americans increase the deficit, while the investment of foreigners in America decreases it.

"Recently, the net outflow of capital has been unusually large for two reasons. First, relatively high interest rates and rising stock market values in Western Europe have attracted American short-term capital. And second, American firms are showing greater interest in long-term investment overseas—both direct investment and purchases of stocks and bonds. The McGraw-Hill Survey on Overseas Operations revealed that U.S. industrial companies are spending 15% more on plant and equipment for foreign subsidiaries this year. But the rate of gain is expected to slow down to only 6% next year.

"On the other side of the account, the Department of Commerce reports that foreign long-term investment in this country has practically ceased for the moment. But any pickup in U.S. production will reverse this development.

"The net effect of all these diverse influences is difficult to predict, especially since speculators over-respond to any unexpected changes in the economic climate. It now appears that the outflow of short-term capital from the U.S. may have already reached its peak, and the outflow of long-term capital may well hit its peak next year. But there will still be a net deficit of more than $2 billion in the capital flow account in 1961.

U.S. Government Transfers

"The Federal Government's expenditures overseas have also recently caused headlines. Our foreign aid programs and the expenditures of American troops overseas have contributed to the balance of payments deficit, and the Government is now trying to reduce all such spending. While continuing support to foreign aid, we are pressing our allies to assume a larger share of the burden. But armed forces spending will be cut all along the line. Foreign governments will be expected to contribute more to the cost of our troops overseas. Fewer dependents will be permitted to join the armed forces abroad. In addition, fewer supplies—military and civilian—will be purchased outside the U.S.

"In conclusion, the outlook is brighter for our balance of payments, and a reduced deficit is in prospect. The danger of a monetary crisis, reflected so clearly in the wild bidding for gold in London a month ago, appears to have passed. Confidence in the dollar will be greatly strengthened as the balance of payments deficit is reduced to more manageable proportions."

Coal's Contribution

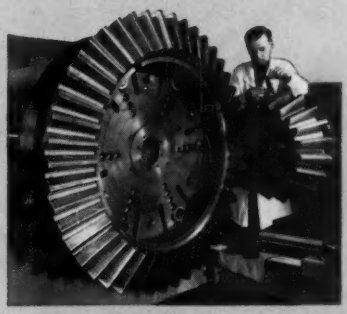
Foremen and managers of coal properties have a function in this issue, especially those who work for companies which contribute heavily to overseas exports. The task immediately ahead was expressed recently in a letter to President Eisenhower from the Coal Exporters Association, promising redoubled efforts to sell American coal abroad to bring back dollars that will help ease the balance of payments deficit. The White House replied that discriminations against exports of American coal to foreign countries will be "strenuously attacked."

The task for coal's supervisors and managers consists of pressing forward in increasing production efficiency in every way possible and in guarding the quality of the types of coal needed overseas. These steps will keep our product competitive in world trade channels.

UNCHALLENGED IN QUALITY

ILLINOIS GEARS

Testing Herringbone Gear With Integral Shaft Pinion



Power Equipment for Testing Large "Coniflex" Bevel Gears and Pinions

With every ILLINOIS GEAR comes the *extra dimension of perfection in quality*...quality that has remained unchallenged throughout the world.

Unchallenged because ILLINOIS GEAR goes far beyond the established standards in maintaining relentless, painstaking control of quality that extends through every step of manufacture to final delivery.

And...no matter how great the quantity, one gear or 10,000 or more...skilled craftsmen equipped with the world's finest and most modern tools and precision quality control equipment, make sure that these high standards of perfection are rigidly maintained in producing each and every gear.

For gears that are made right *with quality as the first consideration*—depend on ILLINOIS GEAR.

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Gears for Every Purpose ... one gear or 10,000 or more

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Operating Ideas

TWO DOZERS working side by side in a slot can double production and prevent spillage.

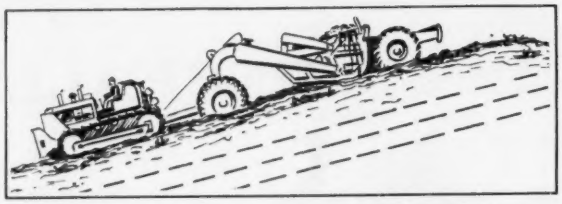
How to Move Dirt Easier

BOOSTING the dirt-moving ability of machines takes many forms. Here are four tested methods, recommended by International Harvester Co.'s Construction Equipment Division.

Gravity—The wise operator puts gravity to work by taking advantage of the natural lay of the land. Whenever possible, material should be dozed or loaded on the down slope.

Slot Dozing—This method requires the dozer to make passes along the same path until a trench is formed. This action keeps the machine in the "slot" and prevents dirt spillage at the ends of the blades. Two dozers working side by side in a slot can double production and prevent spillage between the blades and at the ends.

Ridging—Extra yardage on a scraper job can be obtained by leaving a 3-ft ridge between successive cuts. On the next pass the ridge should be straddled so that more dirt will be thrown into the center of the scraper. Little extra power will be needed to scoop up the thick center section, which will move easily up the loading chute and spill out in all directions.



PUT gravity to work by loading on the down slope.

Planned Dumping—On the spoil area or on a fill, more material should be dumped to the outside edges to make a concave cross section. The edges should be kept high so there will be less tendency for the scraper wheels to go over the side.

Near the end of the working day, it is usually wise to drop the last few loads in the center of the fill. This procedure will form a convex cross section which will provide natural drainage. If it rains during the night, the chances of working the area the next morning will be good.

Tips On Cold Weather Equipment Care

COLD WEATHER creates additional service problems for almost all types of equipment. A sound winter maintenance program must be well planned to cope with these problems.

According to Caterpillar Tractor Co. there are six areas that require special attention for winter operations—lubrication, cooling system, starting system, fuel system, electrical system and air cleaner.

Lubrication—As temperatures drop to freezing or below, lighter weight oils must be used. At below freezing temperatures, the engine crankcases should be filled with SAE 10 oil. The lower viscosity oil permits easier cranking and is fluid enough to circulate freely.

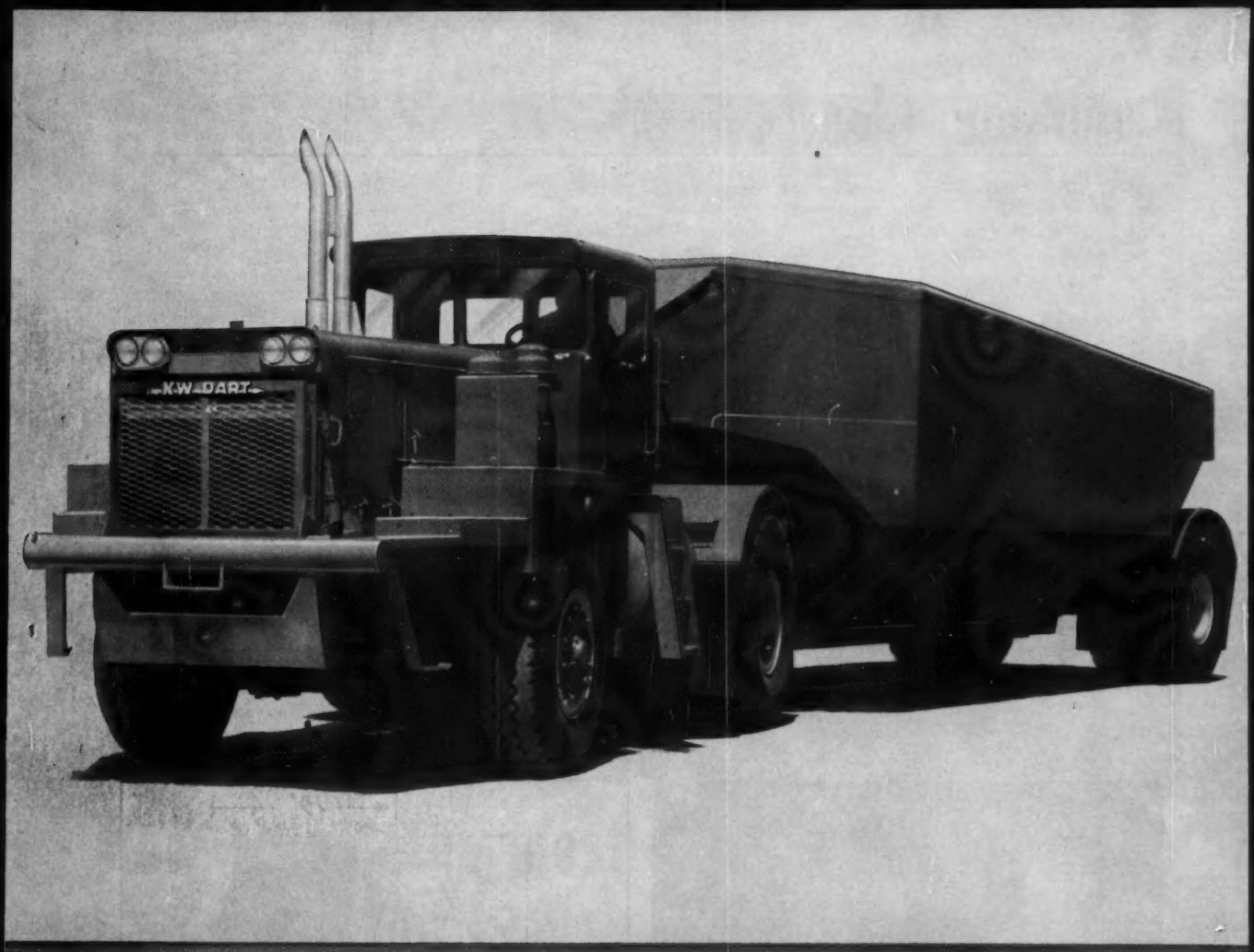
During periods of extremely cold weather it may be necessary to dilute the oil with kerosene to provide sufficient viscosity. When temperatures rise somewhat, however, the diluted oil should be drained and the crankcase refilled with undiluted oil since the thinned oil will not give proper lubrication in warmer weather.

Bearing lubricant must also be changed to a lighter grade in cold weather, with No. 1 or No. 0 the most successful.

When temperatures drop below freezing, Caterpillar recommends a grade of at least No. 80 transmission oil. During extremely cold periods, it may be necessary to thin this oil with kerosene. But the diluted oil should be changed when the extreme sub-freezing weather leaves.

While of great importance in warm weather, lubrication of track and carrier rollers becomes even more important in cold weather operations. Except for the Lifetime Lubricated rollers, which require no field lubrication, it is generally necessary to switch to lighter grades of lubricants during sub-zero weather. Sometimes it may be necessary to use oils in place of grease. The ability of the standard grease gun to handle the grease outdoors is a good general guide as to when it is time to change to lighter grades, or switch to a crankcase or transmission-type lube oil.

Starting—For machines equipped with gasoline starting engines, cold weather



Strong WHERE THE STRESS COMES

You say the going's rough and tough? And the schedules are tight? KW-DART has the answer! Here's a real success story built on strength—extra strength where it's needed to take a beating and never miss a trip. Payloads keep rolling when KW-DART is on the job. Frames, bodies, front and rear axles—all points of stress—are designed for over-capacity. KW-DART vehicles can handle more punishment and move more tonnage, year after year. KW-DART has the long and practical experience to prove this to your advantage with *engineering for your job!*

KW-DART TRUCK CO.

1301 North Manchester Trafficway • Kansas City 41, Missouri, U. S. A.

normally presents little difficulty if both the gasoline and diesel engine are in good shape and the necessary precautions regarding lubricants have been followed.

Diesels depending on either electric or air starting systems, however, are sometimes difficult to start without some additional help when temperatures are below 50 F. The solution is to use additional external heat, such as a manifold air heater or ether starting aids.

Cooling System—Earthmoving and construction equipment require the same anti-freeze protection as automobiles. It is better to use permanent-type anti-freeze solutions in diesel engines because of their higher operating temperatures.

Fuel System—Water in the fuel system can cause trouble. The best way to keep water out of the fuel system is to prevent condensation inside the fuel tank. This can be done by filling the tank completely at the end of the work day. The fuel pushes out the moisture laden air.

Much of the water that still gets into the system can be removed by draining off a small volume each morning. The fuel-filter housing of Caterpillar diesels has a sump which traps any remaining water carried into the fuel. In cold weather this housing should be drained at regular, short intervals to prevent accumulated water from freezing.

For sub-zero operation, a fuel having an unusually low pour point should be used to insure proper flow of fuel from the tank to the fuel transfer pump.

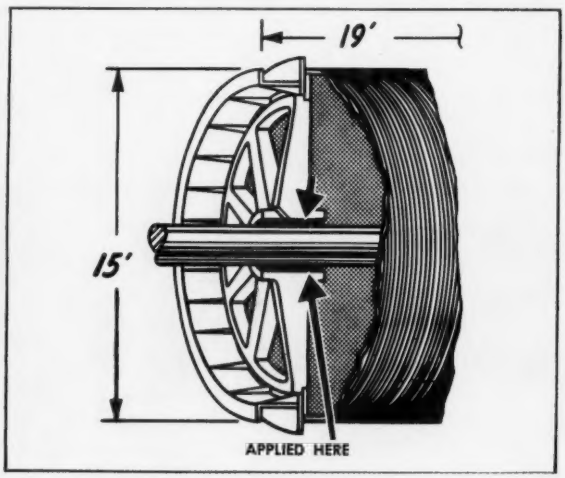
Electrical System—Before cold weather arrives, the entire electrical system should be checked, especially the starting engine magneto. For units fitted with direct electric starting only, special attention should be given to the battery. It should be tested frequently and charged when the gravity drops below standard. A discharged battery should never be exposed to freezing temperatures as the electrolyte will freeze and break the case.

A fully charged battery is especially important in cold weather since a battery's cranking ability drops quickly in cold weather and at the same time the inherent engine drag increases rapidly.

Air Cleaner—Oil-bath-type air cleaners should receive even more careful attention in cold weather. As temperatures drop, oil in the air cleaner cup may have to be changed to SAE 10 so it can be carried up into the screens. If the oil does not reach and coat the screens, the efficiency of the cleaner drops considerably.

When the equipment is operated in blowing snow, the air cleaner should be checked frequently since the cleaner inlet may be plugged quickly.

Dry-type air cleaners, now standard on all Cat-built earthmoving machines, require no special attention in winter operation other than frequent checks against plugged inlets.



Plastic Sealant Makes Temporary Hoist Repair

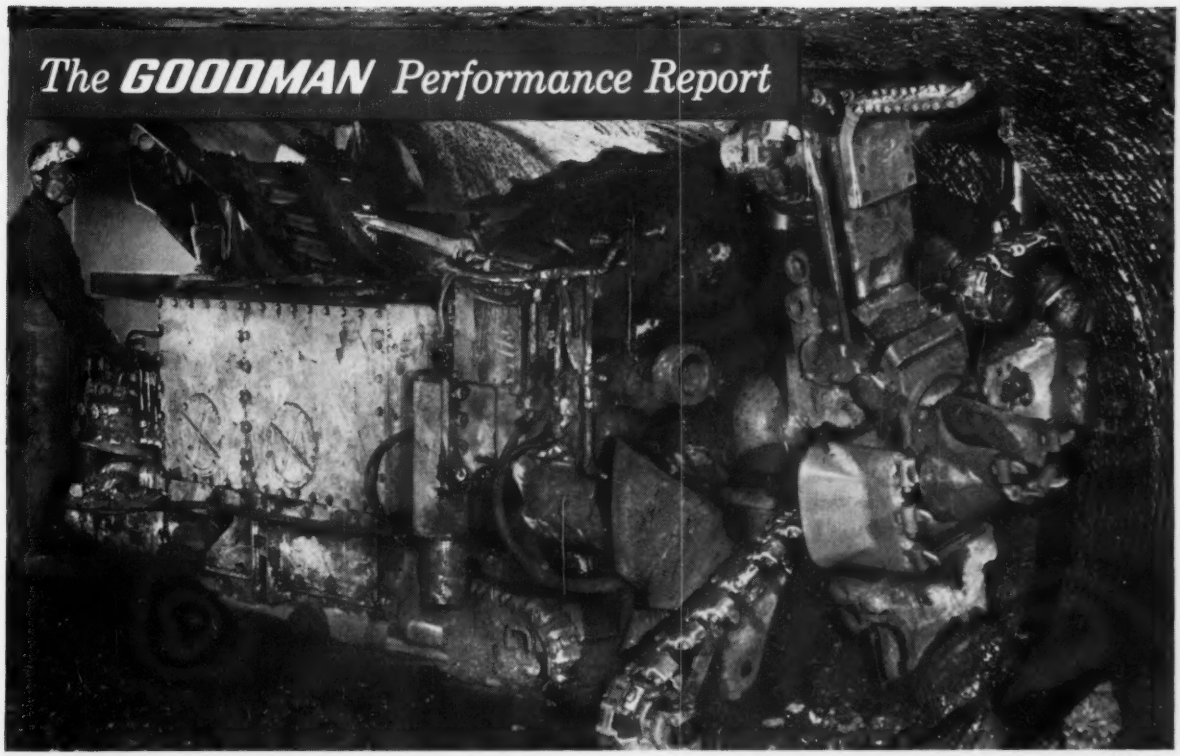
HELPING to prevent the threatened breakdown of a large mine hoist pending delivery of a new drum shaft and spiders is a reported achievement of Loctite sealant, a new plastic compound. The mine hoist, operated by Calumet Div., Calumet Hecla, Inc., Calumet, Mich., has a 15-ft-diameter drum which is 14 ft long and weighs 65 tons.

The breakdown had been threatened by too great a clearance between the shaft and the hubs of its spiders. The hubs had worn so that even with the bolts fully tightened there was a ¼-in clearance. Only a 3-in key kept the drum from revolving freely, and the keyway also was worn to a loose fit.

The problem was presented to an American Sealants representative who suggested the following procedure: (1) wash all clearances with methylene chloride to remove all oil or grease; (2) insert curved shims, ⅛ in thick, and completely covered with Loctite into clearance between shaft and hubs; (3) insert Loctite-coated stainless strips into clearances on sides of keys; (4) drill ¼-in holes in each hub from outside to center and pour Loctite into holes, letting it run over top of shaft and both sides of shims; (5) pull down bolts on each side of hubs.

In making the suggested procedure, the American Sealant representative had to figure the strength of the Loctite bond and make sure it was sufficient to resist the weight of the wire rope cable fully extended; the weight of the skip full of ore; the slope of the line; the force of friction; and the upward acceleration of the mine car. The factor of safety was 10 to 1, according to his calculations.

The suggested procedure was carried out and after only 19½ hr downtime, the hoist was put back into operation. The hardened Loctite filled the clearance and restored the tight fit on the shaft. This emergency repair made possible normal operation until the hoist was shut down almost 3 mo later to install the new shaft and spiders.



21565

How to get the most out of your mine....

PROFITABLY

Fast and rugged, Goodman Continuous Borers continue to establish new highs for production in coal mines.

A 300 Borer, for instance, operating in 60″ coal with a 5-man crew, recently mined 72,794 tons in 117 consecutive day and night shifts. It averaged 622 tons per shift, 124.4 tons per man, per shift. Total advance was 24,314 feet—an average of 207.8 feet per shift.

At another mine, a larger 400 series Goodman Borer mined 45,468 tons in 26 days of double shifts. It averaged 874 tons per shift. Total advance was 10,829 feet—an average of 208 feet per shift.

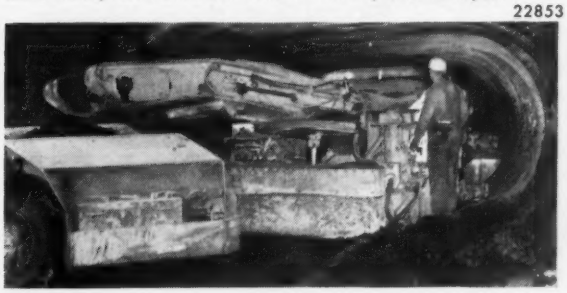
At a third mine, another 400 series Goodman Borer mined 25,129 tons over a 2-month period of 37 day shifts. It averaged 679 tons per shift, 135.8 tons per man, per shift. Total advance was 8,976 feet—an average of 242.5 feet per shift.

These typical examples show not only the high tonnage capacity of every Goodman Continuous Borer, but also the built-in ruggedness that keeps machines at the working face—a combination that gets the most out of your mine . . . *profitably*. For coal from 48″ to 66″, we recommend the type 300 . . . for coal over 66″, we recommend one of the 400 series machines.

Why not ask your local Goodman representative about Goodman Borers? He'll be happy to explain their profit advantages. And, he'll make arrangements for you to see a Goodman Borer at work.

High capacity and low down-time are features of Goodman Borers that make the capital invested look better with each production report.

22853



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CUTTING MACHINES • CONVEYORS • LOADERS
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Use Genuine Goodman Replacement Parts

New Equipment News

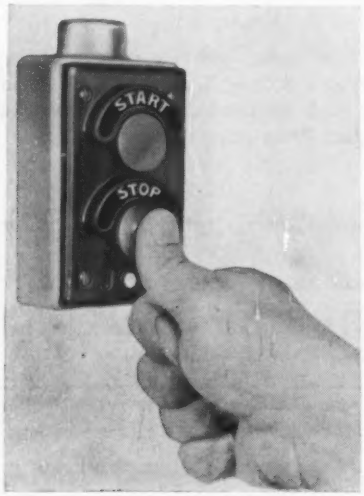
95-Ton Payload

A 95-ton payload truck, the "95-EDT"—a tractor-trailer combination described as the largest production truck in the world—has been presented to the mining industry by the KW-Dart Truck Co., 1301 N. Manchester Tfwy., Kansas City, Mo. Until recently the limiting factors in increasing the vehicle tonnage have been the horsepower requirements and tire capacities. The diesel engine is a 4-cycle V-12 rated at 700 hp and weighs 5,700 lb, giving a horsepower to weight ratio of 8.1 lb per hp. The vehicle tractor-trailer and body has a combined unladen weight of 120,000 lb, thus permitting a payload of 190,000 lb. Said to be unique in mining service, the frame is made up of four heat-treated, pressed steel channels bolted together back to back, in pairs, forming I-beams. Steel used has elastic limit of 110,000 lb psi. Rails are variable in section depth, with the greatest depth coming at the point of greatest stress. A 19-in single-stage converter mounted on the engine delivers power to a 4-speed power-shift transmission equipped with an oil brake. An 1850 Series drive line transmits power to the

KW-Dart 140-S triple-reduction planetary drive axle. High-tensile steel was used in construction of the truss-type body, eliminating much of the parasitic weight. The twin telescopic, straddle-mounted hoist operates at low pressures and features a power down body. The trailer rotates about the rear wheels when dumping and has a full oscillating hitch or fifth wheel. Every conceivable safety factor has been designed into the truck. Dual tires on rear wheels are 21:00x35 tubeless, 36 ply nylon cord; front tires are 18:00x33, 32 ply tubeless nylon.

Pushbutton Motor Control

Joy Mfg. Co., Electrical Products Div., 1201 Macklind Ave., St. Louis 10, Mo., has introduced a new heavy duty push-button station of corrosionproof, all-rubber, weather-sealed construction, known as the "Flexitite Switch." Recommended for any 2-station push-button application—up-down, forward-reverse, etc.—the production model meets NEMA Types 1, 4 and 5 enclosure requirements for both heavy and standard duty operation. It fits all standard FS and FD boxes, permits flush mounting on metal surfaces and incorporates micro type one- or two-pole switches tailored to specifications with normally-open and/or normally-closed contacts. Each switch package includes optional choice of station legend plates and easy-to-operate, snap-in oversize buttons. Molded rubber construction is said to provide complete operator safety, long life and corrosion-free operation. Literature available from Joy.



Nylon Strip-Reinforced Belts

A new method of belt construction using a layer of oriented nylon strip in the core of the belt to give it added impact strength and longer life in rugged applications, has been developed by Goodall Rubber Co., Whitehead Road., Trenton, N. J., in cooperation with Spencer Chemical Co. and Moldings & Extrusions, Inc. Goodall Mucker Belts are designed to be worn out on one side, then turned over and worn out on the underside. In recent operational tests Goodall Mucker Belts made with nylon delivered more yardage of muck from one side prior to turning than most conventional belts deliver from both sides, according to Goodall. Features include a minimum of maintenance and minimum residual elongation.

Need track bolts or spikes in a hurry?

Bethlehem stocks a full range of sizes. For rails from 12 lb per yd up—track bolts with oval necks, rolled threads, and either heavy square or hexagon nuts. Spikes for rails from 12 lb per yd, with hook heads and sharp wedge points.

For quick delivery of track bolts or spikes (and other mine fasteners) call our nearest sales office. Or write to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

Steel

For Strength
. . . Economy
. . . Versatility

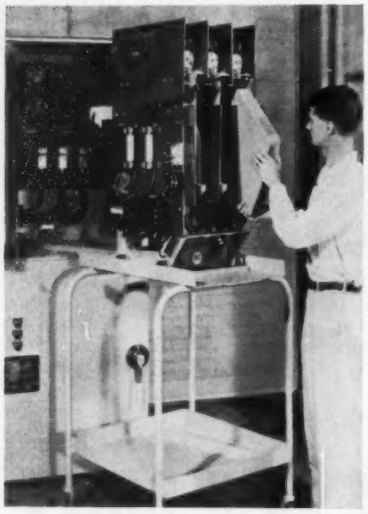
BETHLEHEM STEEL

BETHLEHEM STEEL

Giant Electric Tractor

Here is the 840-hp Pacemaker Series K-104 electric power dozer. Weighing 86,000 lb, this all-wheel-drive diesel-electric-powered tractor has a measured drawbar pull of 90,000 lb at 2 mph. A 4-wheel machine with 75-in tires and a center-pivoted frame for steering, the K-104 is the giant of the new line of "Pacemaker" diesel-electric tractors designed for heavy-duty pushing and dozing announced by R. G. LeTourneau, Inc., 2399 S. MacArthur, Longview, Tex. The new tractors are all-wheel drive with individually powered LeTourneau electric wheels for propulsion. In this system each wheel has its own DC electric motor and gear reduction built inside the rim. LeTourneau electric generators are direct coupled to the machines' diesel engines to power the motors. Smallest of the new line is the Series K-53 Tug-Dozer, a 3-wheeled tractor weighing about 80,000 lb. A modification of this machine is the Series K-53F intended for operation in sand and other areas where high flotation is necessary.

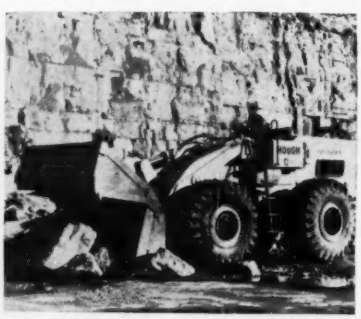
Compact High-Voltage Motor Control



A new concept in high voltage motor control has been announced by Allis-Chalmers Mfg. Co., 986 S. 70th St., Milwaukee 1, Wis. The "Spacemaker" unit is exactly one-half the size of previous models yet with the same rating and capacity as its predecessors. Some of the firsts included in the new controller are: first starter in the 2,000- to 5,000-V range to employ a 2-high design for space saving and first completely drawout control on the market. The unique design is possible because of a compact new air contactor that is said to yield significant operating benefits. Heart of the new equipment is the 400 amp, 5 kv, 50 mva Type 456 air contactor with new glass polyester, flame-retardant, non-tracking "Super Pyro-Shield" insulation which reduces contactor size to only 28 in high by 16 in wide by 24-in deep overall—smallest on the market. New drawout feature consists of a wheeled contactor carriage that carries contactor, main fuses in their supports, main disconnecting finger, control transformers and control transformer primary and secondary fuses and a 2-pole, double-throw test circuit switch. The "Spacemaker" concept will be available as a complete line, with full voltage and reduced voltage, reversing and non-reversing controllers for cage, synchronous and wound rotor motors. Shipment is planned to begin in the latter part of the first quarter of 1961.

Loader and Dozer

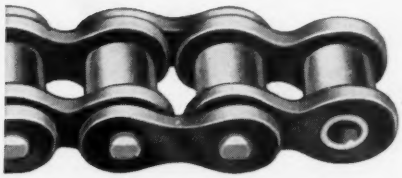
Drott "4-in-1" buckets (left), offered exclusively on "Payloaders," are now available for the largest and smallest models of their 4-wheel-drive line, according to Frank G. Hough Co., 735 7th Ave., Libertyville, Ill. These 4-in-1 buckets make it possible for a Payloader to do normal excavating and loading, bulldozing, clamshell pick-up, and scraping and grading.



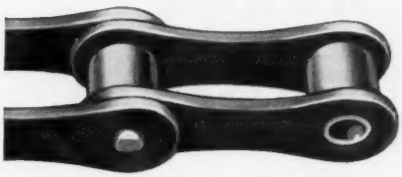
Frank G. Hough Co. has also announced the first model of their new "Paydozer" line, the D-120 (right). Weighing 55,000 lb, this unit is powered by a 300-hp turbocharged diesel engine and has a 3-way blade action including lifting and lowering, forward and backward pitch as well as side tilt. Most unique feature is the fact that it can be converted in less than two 8-hr working days into a front-end loader. Optional package permitting conversion includes boom arms, hydraulic lines, bucket and linkage together with one element of the torque-converter for loader operation. Full details available from the company.

SINGLE STRAND

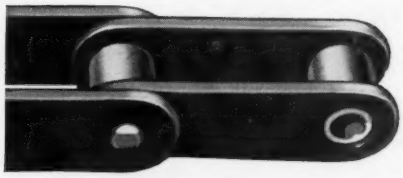
DOUBLE STRAND



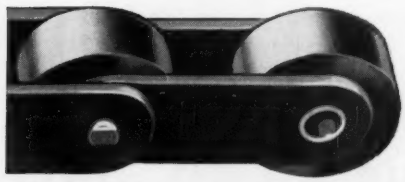
SINGLE STRAND, HEAVY SERIES



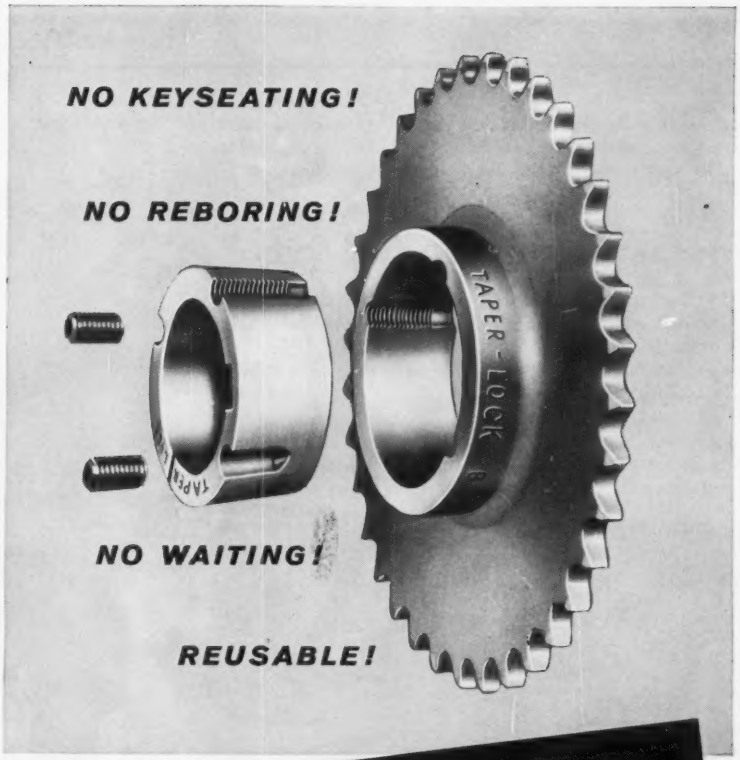
DOUBLE PITCH TRANSMISSION



DOUBLE PITCH CONVEYOR



DOUBLE PITCH CONVEYOR, LARGE ROLLERS



TAPER-LOCK SPROCKETS DODGE ROLLER CHAIN

DODGE Quality Roller Chain, teamed with Dodge Taper-Lock Sprockets, results in chain drives and chain conveyors that have the precision, efficiency and stamina necessary for the real economy of *long life*.

Moreover, Taper-Lock's reusable bushing makes a difference in overall cost. The ease of Taper-Lock mounting, the elimination of reboring, keyseating, and wasted time, add to the saving. Precision machining and true articulation lengthen the life of *both* sprocket and chain.

The Dodge line of chain, including standard attachments, is extensive. It meets a high percentage of all chain requirements.

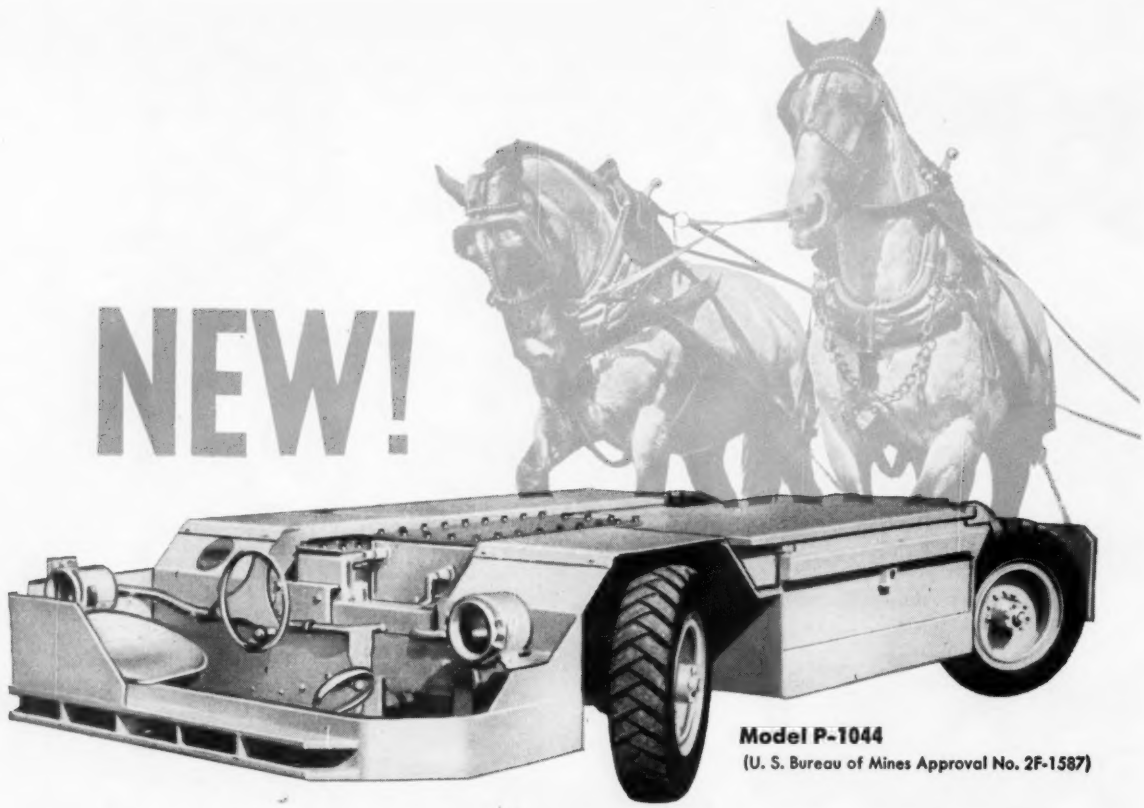
In the Double Pitch series (both Transmission and Conveyor) the sizes which require special spacing for perfect tooth action are offered from stock in special double pitch design — to double the life of the chain and the sprocket!

Ask your local Dodge Distributor. Or write us for bulletin.

DODGE MANUFACTURING CORPORATION, 3000 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the *white* pages of your telephone directory, or in the yellow pages under "Power Transmission Machinery."

DODGE
of Mishawaka, Ind.



Model P-1044
(U. S. Bureau of Mines Approval No. 2F-1587)

KERSEY "BIG WORK-HORSE"
Permissible Tractor

Indispensable emergency unit in case of power failure
Safest method for moving power centers in A. C. mines

Features:

Simple, clean, rugged design for easy maintenance.

Positive 4-wheel drive (equipped with limited slip differentials).

All the power you need with 2-10 H. P. continuous duty motors.

Permissible, explosion-proof unit (approved by the Bureau of Mines) assures greater safety.

Wherever heavy duty permissible equipment is required, put the new Kersey "Big Work-Horse" Permissible Tractor on the job. This Model P-1044, 10,000 lb. rubber-tired tractor has all the features you want and need.

COMPLETE YOUR PERMISSIBLE EQUIPMENT LINE with!—

Kersey Model P-744, 4-wheel drive, steer and brakes, weighing 7,000 lbs. for smaller duty jobs in restricted mine travelways . . . and Kersey Model PPC-9 Permissible Personnel Car and Utility Tractor, which can also double as a tractor for towing supply and man-trip cars.

KERSEY MANUFACTURING CO. INC. BLUEFIELD, VIRGINIA

KERSEY MANUFACTURING CO., INC.
BLUEFIELD, VIRGINIA

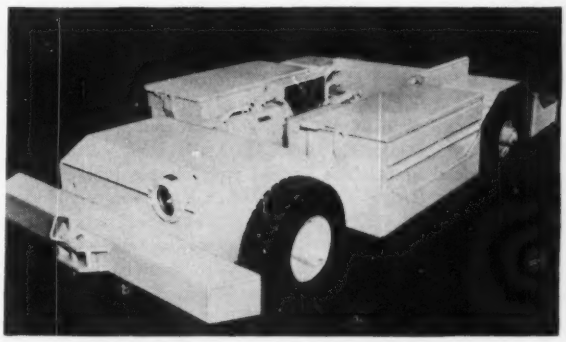
When you want modern equipment for modern haulage and want the best — check with Kersey first

Scraper with Shuttle Cycles

A new electric wheel powered scraper with 30-ton capacity, Series L-28 Electric Digger, has been added to the "Pacemaker" line of R. G. LeTourneau, Inc., 2399 S. MacArthur, Longview, Tex. Its 420-hp diesel-electric power plant and four individually-powered electric wheels for propulsion make the Series L-28 a self-loading scraper in many applications. Principal contribution of the new unit to the development of earth-moving techniques is said to be the introduction of "shuttle" cycles—the machine never turns around between borrow and fill. Electric wheel drive offers the same power and speed in either direction and 2-axle suspension with all-wheel drive is said to make forward or reverse steering equally easy. A rotating seat and control panel (inset) facilitates this type of operation.

Heavy-Duty Battery Tractor

A heavy-duty, battery-powered tractor, designated "Model 3510-A Battery Tractor," has been introduced by Long-Airdox Co., Oak Hill, W. Va. Equipped with 4-wheel drive and 4-wheel steer, this tractor under normal conditions can haul heavy loads at speeds of 3 or 6 mph and is particularly adaptable to pulling trains of 5 to 10 loaded trailers. The unit incorporates a 2-speed, full magnetic contactor control starter and two front and rear axle assemblies for each set of wheels mounted on heavy-duty coil springs. Other features include



FARRELL-CHEEK

ALLOY CAST STEEL MINE CAR WHEELS AND HIGH PERFORMANCE PARTS

MADE OF F85 ALLOY CAST STEEL

Essential parts for every coal mining operation, cast from finest carbon and alloy steels.

Wheels and Rollers • Sheaves and Wire Rope Fittings • Chain, Sprockets and Buckets . . .

Far from ordinary, these highly specialized mine car wheels, electric furnace cast of F85 alloy steel, are establishing new performance and service life records in actual use. A Brinell of 350-400 is provided on treads and flanges with a high degree of ductile toughness in hubs and webs.

You'll want complete information on all F-C wheels and parts for coal mining. WRITE TODAY!

Finest Name in Cast Steel!

FARRELL-CHEEK STEEL CO.

106 LANE STREET, SANDUSKY, OHIO

"FOUNDRYMEN FOR OVER FIFTY YEARS"

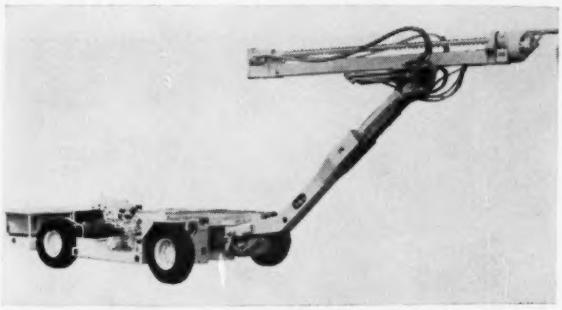
F85 F-C

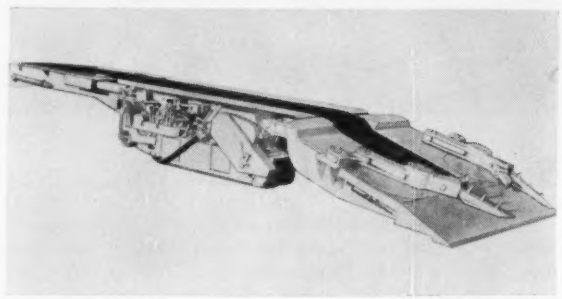
USBM permissible type electrical enclosures; 48-cell, 96-V, 240-amp hr capacity batteries; and battery trays mounted for easy accessibility. Weighing 8,300 lb with batteries, the tractor employs standard 650x10, 10 ply, lug tread tires and is equipped with a 6-in-dia trip gong to serve as a warning device. A selenium rectifier-type battery charger is offered for AC operation and for DC, a resistance type charger. Long-Airdox Type 1051 trailers with capacity to 2,000 lb are available for use with the tractors.

Drilling and Loading Units

Designed for high capacity mining systems, the "TDF-25" mobile coal drilling machine (upper) features the "Rotary Thrust" drilling principle in which drilling thrust is applied only 10 in from the face. Combination of thrust and ball bearing guides in the drill head is said to permit faster, surer drilling. The machine can drill holes 9 to 11 ft deep in 12 to 15 sec and place holes parallel to the roof and only 2 in from it. Equipped with 4-wheel drive and 2-wheel steer, tramming speed of the machine is 0 to 150 fpm. Other features include a horizontal drilling range of 16 ft and vertical range from 20 in to 9 ft and all hydraulic functions. For additional information write Long-Airdox Co., Box 331, Oak Hill, W. Va.

A coal loading machine (lower) with reverse link, double-arm gathering design—the "188-3"—has also been introduced by Long-Airdox Co. Designed for heights 23½ in and up and for all seam conditions, rated capacity of the unit is 12 tpm. Efficient loading is said to be achieved by shorter, faster, more powerful arm strokes with 30% more torque per stroke. The loader operates by cushioned hydraulic clutch actuation and has simple, single reduction, reverse gear transmissions mounted on each crawler. Among other characteristics are a flat 15-deg head angle and single motor operation at 80 hp AC or 40 hp DC. Three models are offered.





SIMPLEX MINE JACKS

6 WAYS BETTER

- ★ Ratchet lowering lever type for speed with safety
- ★ 5-tons capacity (other models to 35 tons)
- ★ Double-lever sockets permit lifting in close quarters
- ★ Full capacity on cap *OR GROOVED* toe
- ★ Safety Speed Trigger
- ★ Ideal for re-railing, repairs, skidding

No. 84A for Thin Seams 14" high, 7" lift

No. 85A for Medium Seams 17" high, 10" lift

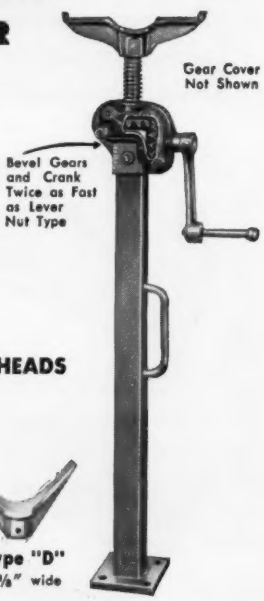
No. 86A for Thick Seams 20" high, 13" lift

SIMPLEX JACKS

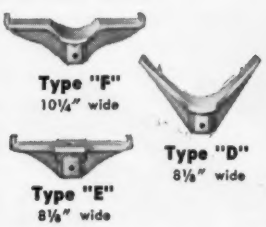
Hi-Speed TIMBER JACK

MODEL NO. 642 LIFTS 6 TONS

Combines safety of screw jack with fast action of crank. Head swivels. Five models with min. ht. from 3'6", max. ht. to 9'6".



3 TYPES OF HEADS



Type "F" 10¼" wide

Type "D" 8⅛" wide

Type "E" 8⅛" wide

Write for Mines Bulletin for data on the most complete line of Mine Jacks

TEMPLETON, KENLY & COMPANY
WORLD'S LARGEST MFGRS. OF INDUSTRIAL MECHANICAL AND HYDRAULIC JACKS
2501 Gardner Road, Broadview, Illinois

Mines Bureau Tells How Addition of Salt Improves Safety of Certain Mining Explosives

News release from the U.S. Department of the Interior, Bureau of Mines: Research by the Bureau of Mines has confirmed that the addition of from 10 to 20 percent ordinary salt to "permissible" explosives used in coal mines increases their safety factor, the Department of the Interior has announced.

A report recently published by the Bureau describes its studies which revealed effects of varying proportions of fine and coarse salt in cooling the flames emitted by explosives, thus lessening their chances of igniting gas or coal dust.

As a result of the research, undertaken in cooperation with the Institute of Makers of Explosives, one major United States manufacturer already has changed his formulas. He now adds 10 percent fine salt to his entire line of "permissible" explosives.

Director Marling J. Ankeny of the Bureau of Mines pointed out that the Bureau does not claim credit for the idea of adding salt to explosives; the practice originated in Europe. However, he added, the Bureau proved, in a series of 2,400 test explosions of 87 different formulations, that permissible explosives with salt additives are safer and that fine salt is more effective than coarse salt.

The label "permissible" is applied to an explosive after it has been approved by the Bureau for use under carefully specified conditions in underground coal mines. Users sometimes violate accepted safety standards for handling explosives. The Bureau, therefore, always seeks to reduce the so-called incendivity of permissible explosives so that if they are misused they are less likely to ignite gas or dust already in the mine atmosphere.

From 80 to 100 million pounds of permissible explosives are manufactured annually in the United States, and the Bureau believes it is quite likely that all makers of permissible explosives eventually will adopt salt formulas, Director Ankeny added.

Report of Investigations 5683, "Reducing the Incendivity of Permissible Explosives by Sodium Chloride," was written by N. E. Hanna, G. H. Damon, and R. W. Van Dolah. A copy can be obtained from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa.

WHO? This "one major manufacturer," who has manufactured his entire line of permissibles with 10% salt for over two years, is Du Pont. For information, call your Du Pont Explosives Distributor or Representative. Or write Du Pont, Explosives Department, 6440 Nemours Building, Wilmington 98, Delaware.

DU PONT EXPLOSIVES

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

Typical Installation on Main Haulage

- Rugged.
- Low in Cost.
- Easy to Install.
- Increases Production.

"Cheatham Switch"

TRACK SWITCH THROWER ELECTRICALLY OPERATED

This modern track switch is thrown swiftly and safely by motormen as they sit in their cabs. It saves time and money, and is fool-proof and dependable!

Over 50 years experience manufacturing

ELECTRIC TRACK SWITCHES and DERAILS

Write for Catalog

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NUSSCO AUTOMATIC BLOCK SIGNALS FOR MINES

Save Trip Time on Main Haulage
Prevent Collisions

A two wire cable connects two or more signals together into one block. Only one signal can show proceed on the entrance of a trip, all other signals show stop.

NACHOD & UNITED STATES SIGNAL CO.
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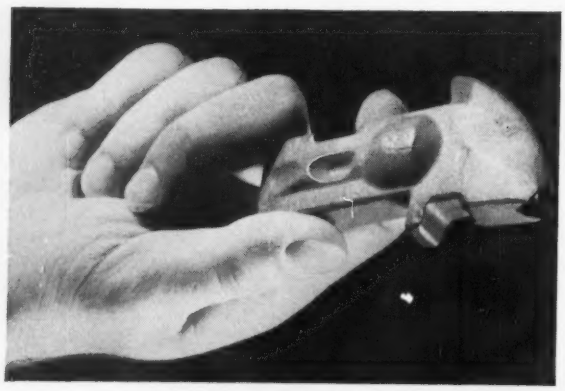
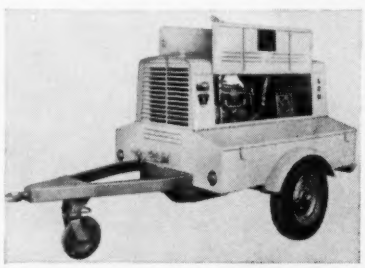
Quick Change Cutter Bit



Carmet's "RSS-Quick Change" cutter bit, with 1¾-in gage stop on front, is said to save up to 85% changing time on Joy V-Type ripper changes and features a 65% increase in strength. Bit changes are reported to be just as fast and easy in bit rings and twin-borer bit blocks. Easy operation is accomplished as follows: A threaded plunger designed by Joy engages a forged notch in the bottom of the tool shank. This keeps the cutting tools locked in place. To remove, simply pry set screw plunger outward to retracted position, thus releasing the cutter bit. The plug-type carbide insert used is set at an angle that eliminates braze failure and insert loss. A removable step 1 in below the carbide cutting edges relieves the shank tip for easier regrinding. For further details write to Carmet Div., Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.

CONTROL CABLE—An industrial control cable with chemically cross-linked polyethylene insulation is offered by General Electric Co.'s Wire and Cable Dept., Bridgeport 2, Conn. This thermosetting insulation—called "Vulkene"—is reported to combine electrical properties similar to those of polyethylene with thermal properties superior to those of heat-resistant conventional rubbers. Designed for general usage in air, conduit, underground ducts or direct burial, the cable has a high overload rating and is especially useful for high-ambient temperature applications and long circuits. Complete specifications, application data and product comparison data available from Bridgeport.

ROTARY AIR COMPRESSOR—Designed to reduce service costs, a 125 cfm rotary portable air compressor has been announced by Le Roi Div., Westinghouse



NEW! REVERSIBLE RATCHET BIT WRENCH

. . . Speeds bit changing time on all mining machines using ¾" set screws

Look At This...Saves ½-Hour Every Shift

Keep one on each machine . . . you'll make extra savings on every bit changing job

PAT. PENDING

Solid, forged steel handle is 18⅝" long.

Only reversible ratchet bit wrench made . . . changes direction of stroke without removal. Works efficiently even where side clearance is only ½". Box-wrench on one end is for "Sledge-hammer jobs." A required tool on machines where more profitable operation is important.

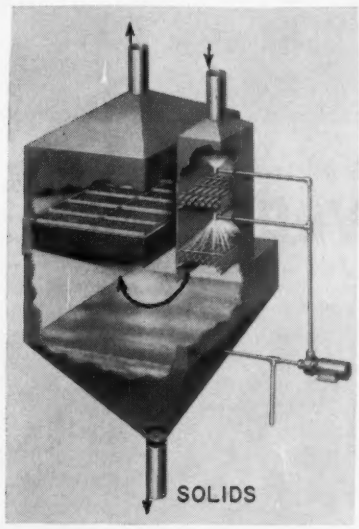
Write for Illustrated Literature and Prices — FREE

NORTH AMERICAN GEAR COMPANY
39 East Campbell Street Blairsville, Pa.

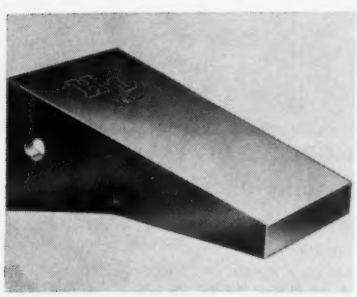
Mfgr's of Parts For Mining Machinery

New Equipment *(Continued)*

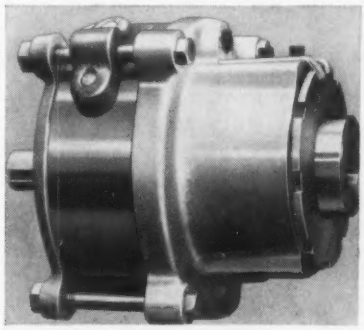
Air Brake Co., Sidney, Ohio. It is powered by a Le Roi D226 wet sleeve engine; the larger displacement of this engine over the former power unit provides a 15% increase in horsepower. The 53-hp engine provides 60% power surplus. Features of the engine include stellite exhaust valves and valve seat inserts and valve rotators. Diesel and utility models are also available.



DUST COLLECTION – The "L-S Air Scrubber," marketed by Antipol Corp., 407 Hill Arcade Bldg., Galesburg, Ill., collects coal dust on low power with no moving parts. It utilizes a water spray over stainless steel screening to entrap impurities and discharged air may be recirculated in the plant without risk of contamination. Dust recovery as high as 99% and low water consumption of as little as 1 gpm per 1,000 cfm of air are reported results of installations tested. The same basic design is employed in all models with self-contained units available up to a capacity of 50,000 cfm.



FORGED POINT – To meet increasing demands of the excavating field for greater digging service, the "40-L" all-forged one-piece point for shovels of 8-9 yd capacity is offered by H & L Tooth Co., 1540 S. Greenwood Ave., Montebello, Calif. It is mechanically forged-to-shape from high-nickel alloy steel and is said to have an extreme resistance to severe abrasion and high impact resistance even in extreme cold. The 40-L has the H & L Flexpin type connection that secures the point to the adapter.



GEAR REDUCER—Crichton Co., Johnstown, Pa., is producing a shaft-mounted planetary gear reducer with ratios from 3½:1 to 36:1, and in a horsepower range from 4 to 30. According to the company, the new reducer offers up to 50% savings in weight and space and is available in either steel or aluminum housing. Higher ratios and horsepower are offered in Crichton's standard foot-mounted units.

SLUDGE PUMP—Lighter by 17 lb than its predecessor yet capable of twice as much lift, the "CP-71" sludge pump can eject 40 gpm at an unmatched 200 ft head and 100 gpm at 50 ft head, according to Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y. Designed to handle liquid containing up to 15% solids, the CP-71 can reportedly handle rock drill cuttings, sand, etc. without causing rapid wear of expensive internal parts. Since there are no diaphragms, stuffing boxes, rotors, impellers or pistons to maintain, it is almost trouble-free. Air passing through the venturi sucks liquid into the pump. When the pump is full, air pressure forces the liquid out and the cycle is repeated automatically. It operates on an 85 cfm compressor and requires no priming.

RUSLON* PVC CONVEYOR BELTS

shrug off moisture and oil because of their interlocking nylon yarn construction and their complete impregnation with polyvinyl chloride plastic . . . all the way through: no rot, no mildew, no deterioration.

Of all belts on the market, Ruslon gives maximum resistance to ripping and slitting.

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*The trademark of Ruslon Fenaplast Conveyor Belts.

Manufactured in the United States by

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Is Your Hoist Retarder or Car Spotter Hoist *Eating Up Your Rope and Cutting Profits?*

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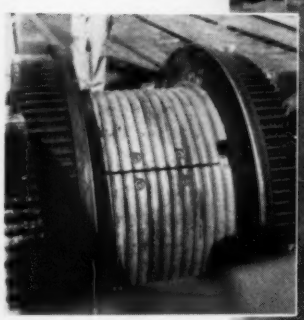
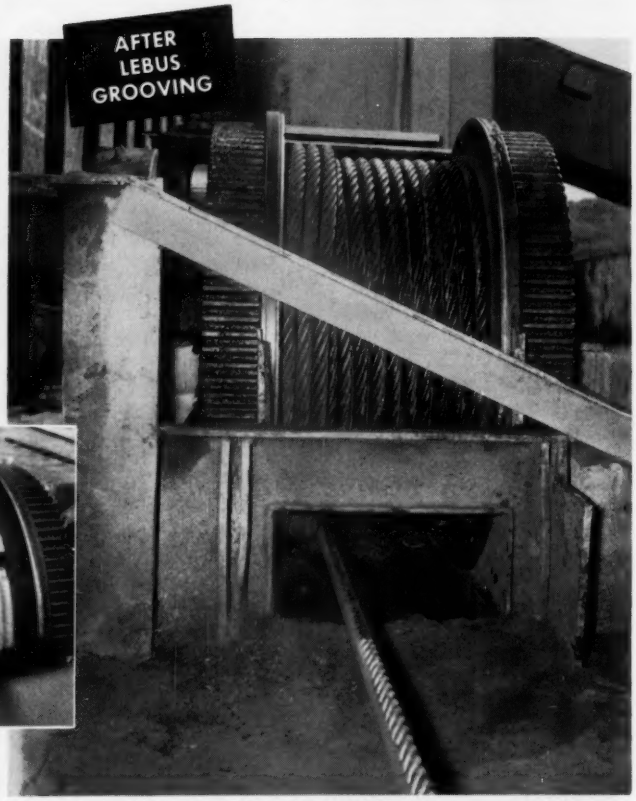
Wire rope shown above, scrubs, frays, wears, and crushes dangerously in a short time without properly grooved drums.



LeBus machine grooved steel split sleeve applied to old retarder hoist drum.



Now by adding LEBUS GROOVING to your old drums, you can get many times the use from rope and keep your wire rope in safe condition without frequent replacement.

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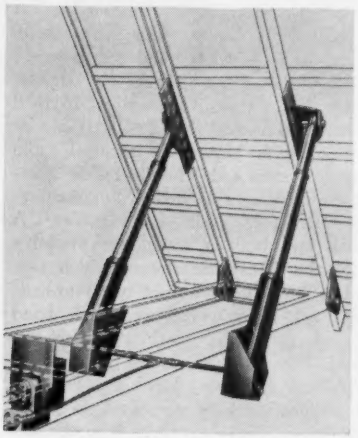
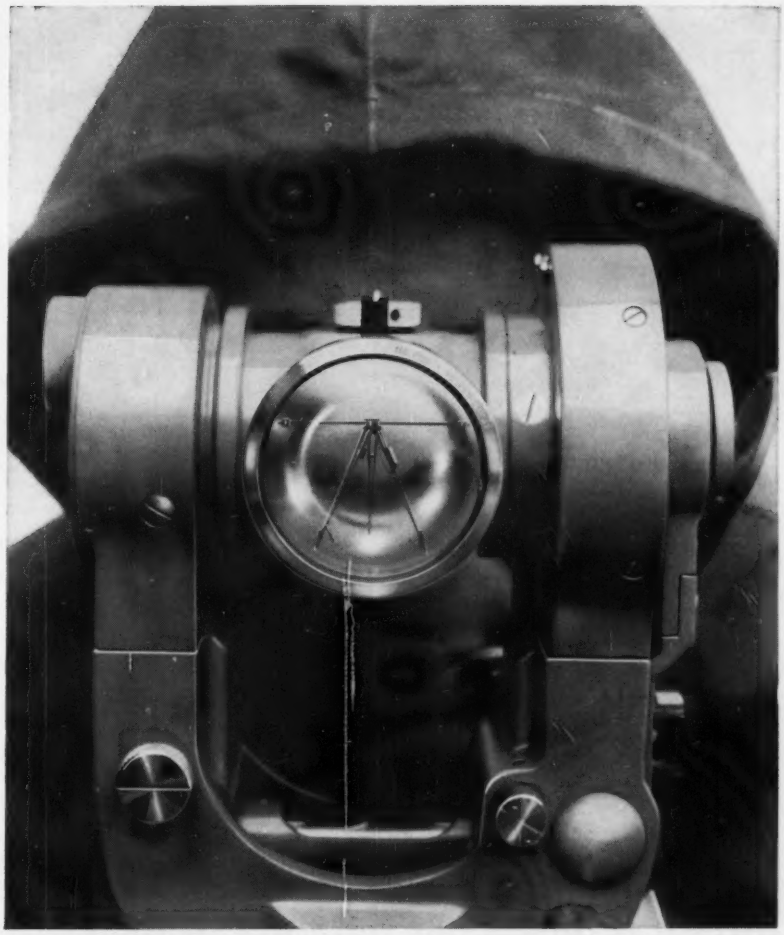


CONVERSION HOIST—Galion Allsteel Body Co., Galion, Ohio, has added to its line a field-tested, outside mount, 2-stage duo-scopic conversion hoist package which it is reported can be easily mounted directly on a truck frame—no subframe needed. Gvw range is 10,000 to 19,500 lb and payload rating is to 14 tons depending on body length and pivot. Body platform lengths of 11 to 13½ ft and cab-to-axle dimensions of 84 to 102 in are recommended. The duo-scopic units have a 45-in stroke providing a 45-deg dump angle. Other features of Model 33245 include a built-in pressure relief valve and bronze wear plates.

ENGINEER'S LEVEL — An exclusive feature of the "Wild N-2" engineer's level is the telescope which, together with the level vial assembly, can be rotated about the optical axis for checking level adjustments quickly. Other characteristics include 24 or 28 power telescope with coated lenses, internal focusing, clamp and tangent screw, tilting screw with leverage and coincidence-reading tubular level. Designed for general engineering work on tunnels, construction, roads and bridges, the new level is offered by Wild Heerbrugg Instruments, Inc., Port Washington, N. Y.



THE UNIVERSAL STANDARD for accuracy, ruggedness and speed of operation. With readings direct to one second, the instrument is ideal for triangulation and laboratory use. AVAILABLE WITH A COMPLETE RANGE OF ACCESSORIES... Invar Subtense Bar, Diagonal Eyepiece Set, Pentagonal Objective Prism, and Autocollimation Eyepiece.

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One of a *complete* line of superb instruments for Surveying, Photogrammetry and Microscopy. *Write for Booklet T-2.*

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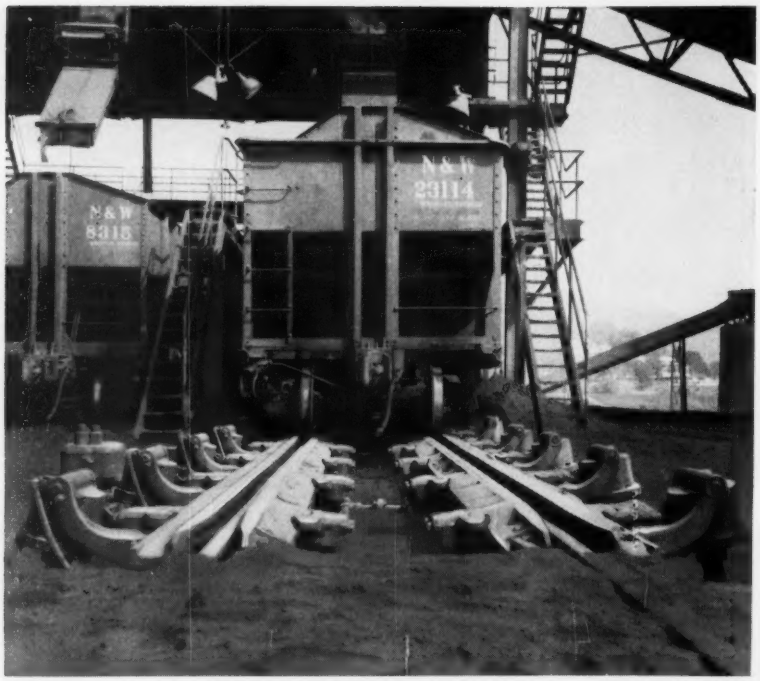


Clinchfield loads 20,000 tons of coal a day safely with Union Switch & Signal Car Retarder System

500 coal cars a day roll through Clinchfield Coal Company's preparation plant at Carbo, Va. They are loaded and classified with a Union Switch & Signal Car Retarder System. The system is fast, accurate and economical. It lets three men do the work of sixteen men. Two yard men and a control tower operator load clean coal at the rate of 20,000 tons on a three-shift schedule—*safely*.

Here, the empty cars drift down a slight grade to a retarder where they are coupled in small groups. Then the cars drift to one of the five coal loaders. After a car is loaded, it is uncoupled and then drifts to the automatic retarder which releases the car for the storage yard at a pre-set speed depending on where the control tower operator wants to place the car in the yard.

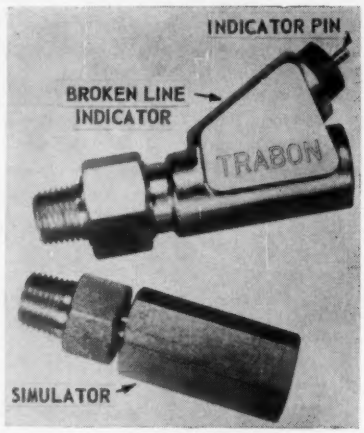
If you would like to have complete information about Union Switch & Signal's Car Retarder Systems, contact your nearest Union Switch & Signal office. Or, ask the people who have already installed this equipment.

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
SWISSVALE, PENNSYLVANIA
NEW YORK .... PITTSBURGH .... CHICAGO .... SAN FRANCISCO

New Equipment *(Continued)*

COMMUNICATIONS—Motorola Inc. has expanded its 2-way radio base station line with new desk-top and high powered models. Called the "Consolette" station, the table top unit measures 15x18x9 in and weighs less than 40 lb. It can be utilized with Motorola's personal radio paging system and "Handie-Talkie" portable radiophones as well as to communicate with vehicles in plants or away. A clock and built-in meter are available with the Consolette station which provides 25-w power output when utilized with systems operating on high band frequencies and 30 w when used on low band. The new base station designed for 25-54 mc frequency band, can be used in conjunction with any Motorola 2-way mobile or portable unit. The greater punch is designed to extend coverage to fringe areas. Cabinet radiation is reduced through incorporation of a shielded amplifier. For optimum safety, tuning controls are accessible from the front of the amplifier. Further data is available from the Communications and Industrial Electronics Div. of the company at 4501 W. Augusta Blvd., Chicago 51, Ill.



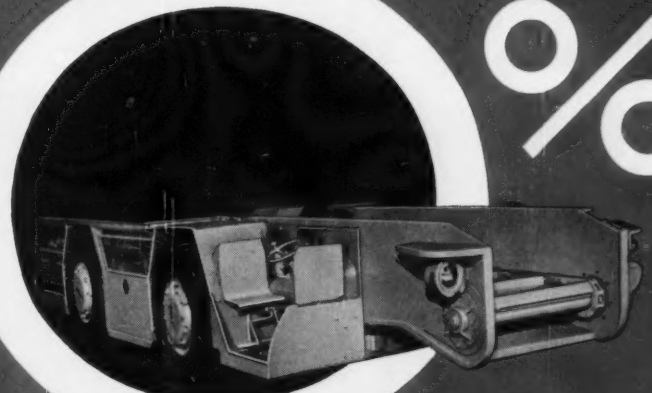
BROKEN LINE INDICATOR—Central warning of any broken lubricant-bearing line plus visual indication at trouble spot by indicator pin which retracts from normal protruding position, is provided by the new Trabon Broken Line Indicator. Featuring all-hydraulic operation, the new device is designed for use with Trabon Type M and MX centralized grease and oil systems and Type MO and MXO circulating oil systems. Indicator spring pressures ranging from 400 psi for circulating oil to 1,200 psi for large grease systems are available from the manufacturer, Trabon Engineering Corp., 28815 Aurora Rd., Solon 39, Ohio.

Equipment Shorts

Transmission—A new power-shift transmission for small, off-road vehicles

Another Time-Proved **TORKAR** Fact . . .

REBUILDING Costs 50% LESS with TORKAR



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✔ **Our customers know it** from their own experience

✔ **WE KNOW IT** (we have rebuilt every make of shuttle car)

Hand-in-hand with the record low operating costs achieved by TorKars in daily service go lowest rebuilding costs. Our own and customers' records prove that when a TorKar eventually requires rebuilding, the cost is normally only 50% of competitive shuttle cars. *The reasons are clear:* SINGLE MOTOR, TORQUE CONVERTER, TRUCK TYPE TRANSMISSION AND WHEEL UNITS . . . RUGGEDLY CONSTRUCTED BODY . . . SIMPLIFIED ELECTRICS! Let us give you the complete TorKar facts!

National Mine Service Company

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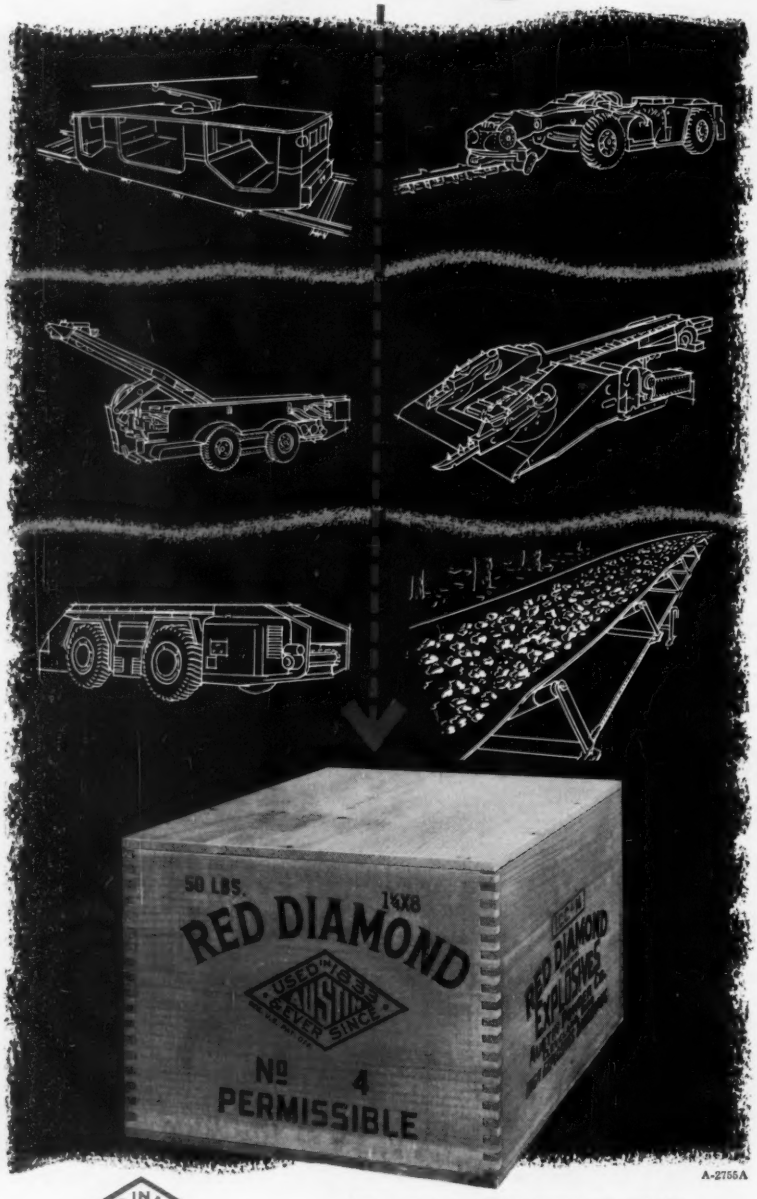
Basic tools of underground mining



A-2755A

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AUSTIN

POWDER COMPANY

CLEVELAND 13, OHIO

explosives • ammonium nitrates • primers • detonating fuse
permissibles • blasting supplies • AP drill heads and bits • mine tools

New Equipment (*Continued*)

is being produced by Clark Equipment Co., Automotive Div., Jackson, Mich. Designated the 2000 Series, the new transmission, designed for use with the Clark 270 series torque converter, will be used with gasoline or diesel engines of approximately 200 lb ft of torque output. Major design feature is a system of four hydraulic clutches, making available two forward and two reverse speeds, fully power shifted. Complete specifications from the company.

Traction Tire—Recommended for essential service vehicles that must operate in mud or snow and designed to provide good traction in both reverse and forward gear, the "Silvertown All-purpose Traction" tire features non-directional, extra-wide, extra-deep, tread patterns. Indented and staggered open-shoulder cleats provide continuing traction in rough going. V-shaped tread grooves expel mud, snow and stones. Manufacturer is B. F. Goodrich Tire Co., Div. of B. F. Goodrich Co., Akron, Ohio.

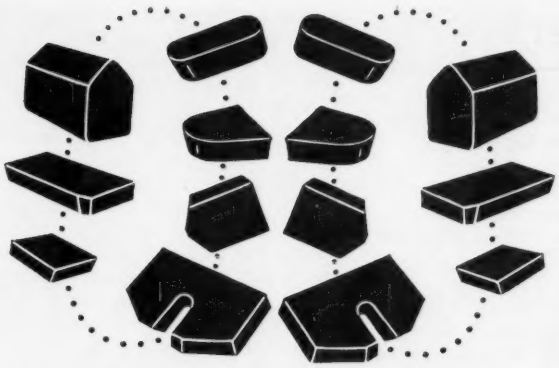
Pushbutton—An oil tight, illuminated pushbutton, combining functions of a pushbutton and an indicating light in one unit, can operate with multiple contact blocks with any combination of N.O. or N.C. contacts, according to the manufacturer, Cutler-Hammer, 220 N. 12th St., Milwaukee, Wis. It incorporates a color-coded, molded type transformer designed to be immune to voltage-surge lamp damage and is available for 110, 220, 380, 440 and 550 V applications.

Free Bulletins

Mining Equipment—Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y., offers Brochure SP-3286 featuring equipment covering most every phase of mining. Its 16 pages displays detailed descriptions and illustrations of the newest drilling equipment on the market.

Screening—A handbook designed as a reference manual containing general and technical information on wire screens and their use may be yours by writing Hoyt Wire Cloth Co., P. O. Box 1577, Lancaster, Pa. It contains square footage, decimal equivalent and equivalent size charts in addition to the usual wire cloth tables, and data on crimp types, edge types and wire sizes.

Materials Handling—Bulletin P10-B44 describes the varied industrial applications of WEMCO's nonclog Torque-Flow pump. Write to Sales Prom. Dept., WEMCO, a division of Western Machinery Co., 650 Fifth St., San Francisco 7, Calif.



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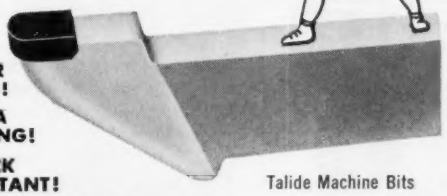
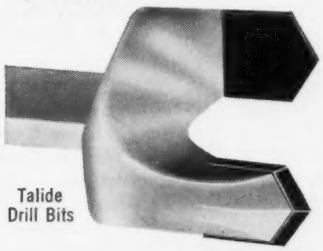
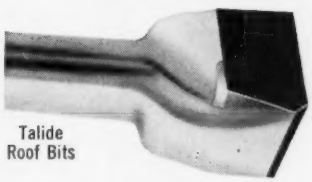
2. EXTRA STRONG!
3. SHOCK RESISTANT!



Talide Machine Bits



Talide Drill Bits



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Fabricators! Users! Talide Tips give exceptionally long service on machine bits, rock bits, drill bits, roof bits and open pit bits. Talide Tips have a special surface finish that facilitates brazing. Non-standard sizes and shapes quoted on request.

For cutting or drilling
COAL · ROCK · SHALE · SLATE · STONE · ORE
Use job-tested and approved

Talide MINING TOOLS AND TIPS

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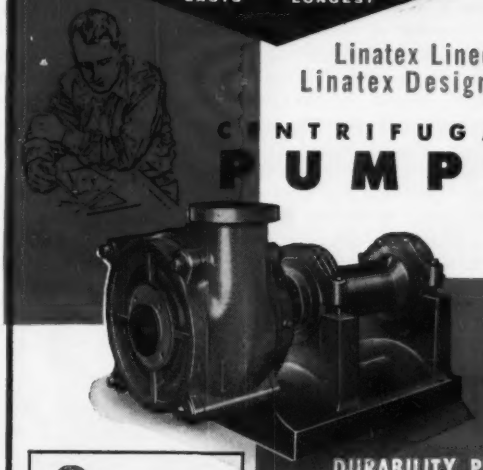
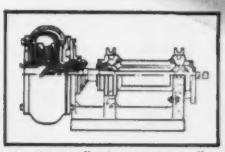
PUMPS





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Among the Manufacturers

Thomas E. Brown has been appointed assistant director of sales of the Explosives Dept., Hercules Powder Co. He joined the firm in 1939 as a chemist and since 1940 served in the Explosives Dept. in both production and sales. Prior to his new promotion, Mr. Brown was district manager of the Pittsburgh district since 1956 and has been replaced in that capacity by **Robert F. Kelleher. Robert J. Shiel** has been named assistant district manager to replace Mr. Kelleher.

Jack D. Hayes has been named general manager of the Explosives Dept. of Hercules Powder Co. Formerly assistant general manager of the department since 1954, he succeeds **John M. Martin** who was elected a vice president of the company.

Harlan K. Knudson, Denver, has been named sales agent for mining tools by Vascoloy-Ramet Corp., Waukegan, Ill. He will supervise sales and distribution of V-R bits in Colorado, Wyoming, and Utah. Mr. Knudson had formerly held positions with Schramm, Inc., and Reichdrill Div., Chicago Pneumatic Tool Co.

John G. Roeschlaub has joined Mine & Smelter Supply Co., Denver, Colo., as a sales engineer. His previous metallurgical experience includes work with Patino Mines & Enterprises, Resurrection Mining Co., National Lead Co., Rare Metals Corp., and Stearns-Roger Mfg. Co. Mr. Roeschlaub was also a metallurgist for Southern Peru Cooper Corp., at their new Toquepala plant.

Robert J. Urlakis has been appointed sales representative, large machines, for Bucyrus-Erie Co. In his new capacity, Mr. Urlakis will implement sales and service for a complete line of large excavating and drilling equipment and will headquarter at the firm's Pittsburgh office. A 19-yr veteran of the company, he had held sales engineering positions prior to his recent appointment.

Steve G. Sutton has been named manager of public relations, Jeffrey Mfg. Co., Columbus, Ohio, succeeding **L. H. McReynolds,** advertising manager, who is retiring. Mr. Sutton was with the sales department of Monsanto Chemical Co. before joining Jeffrey in 1957. He has been assistant manager of distributor sales for the past 2 yr.

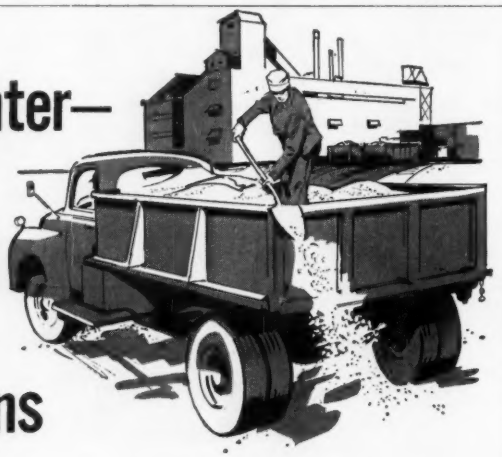
George E. Gunther has been appointed domestic sales manager for the Trojan tractor shovel line of Yale & Towne Mfg. Co. and will headquarter in Batavia, N. Y. He has been associated for the past 12 yr in various sales capacities with the Thew Shovel Co. of Lorain, Ohio. Previous to that he was with the American Chain & Cable Co., Inc. where he started his career in 1931.

David L. Litten, formerly lighting sales engineer, is now sales manager of Westinghouse Electric Corp.'s lighting division, Cleveland, Ohio. In his new post Mr. Litten will be responsible for coordinating the activities of the company's regional lighting sales managers.

A. Campbell Jr. has been promoted to manager of sales and marketing services for the Thermoid Div. of H. K. Porter Co., Inc. at Trenton, N. J. During his 23 yr with the Thermoid Div., Mr. Campbell served in various sales and customer service capacities.

Hewitt-Robins Incorporated, Stamford, Conn., has made **Norman M. Godfrey,** former eastern sales region manager, manager of the firm's Robins Conveyor Div. **Arley J. Ball,** formerly sales manager of the Cleveland district, will replace Mr. Godfrey.

This winter—
speed
your
colliery
operations



Use Sterling Rock Salt to keep your roads, platforms, walks clear and safe . . . to prevent frozen switches and scales. This powerful melting agent helps remove treacherous snow and ice *fast!* It eliminates costly delays around the mine, saves labor during critical cold-weather periods. Sterling Rock Salt is easy to handle and apply, is harmless to hands and clothing.

Give your customers "free-running" coal, too! Sterling Rock Salt prevents coal from freezing in transit, so it can be unloaded quickly and easily. (It takes only 5 lbs. of Sterling Rock Salt to protect one ton of bituminous; 5-8 lbs. for anthracite.) Customers will gladly pay the small premium for coal treated with Sterling Rock Salt! Comes in bulk carloads or packed in 100-lb. bags.

Free folder gives further information on Sterling Rock Salt for mines, collieries. Ask your Sterling representative or write to INTERNATIONAL SALT COMPANY, DEPARTMENT CA-161, CLARKS SUMMIT, PA.

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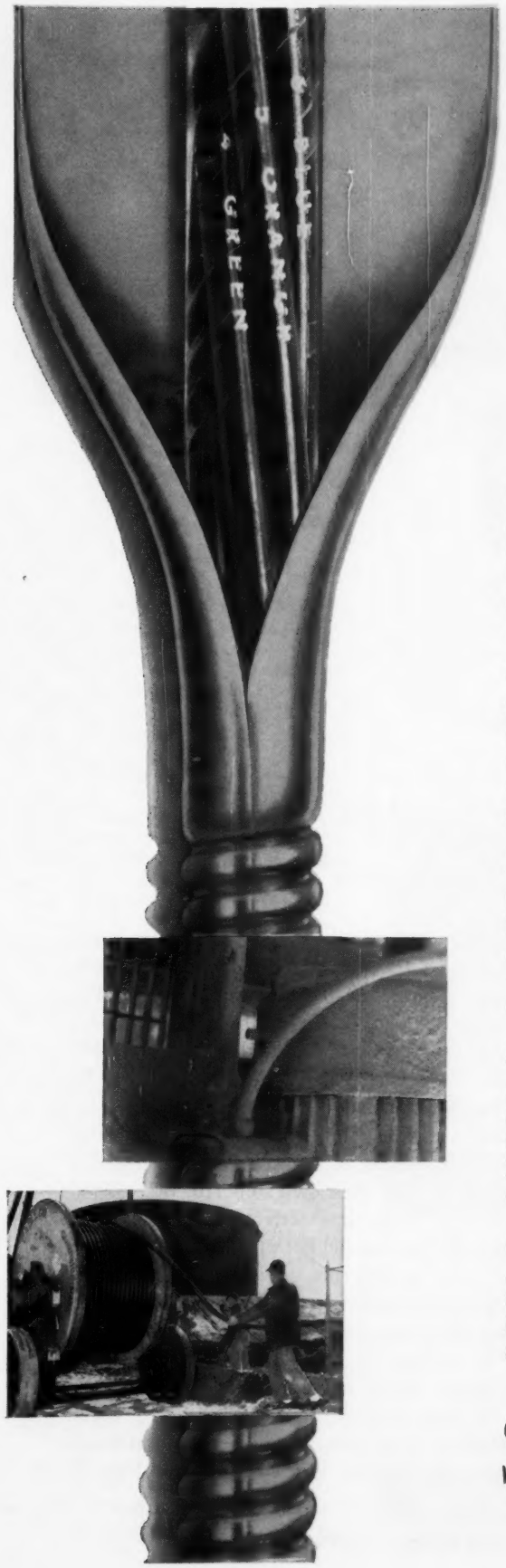
STERLING ROCK SALT
INTERNATIONAL SALT COMPANY, INC.



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Sealed Cable Systems by Simplex Can do so Many Jobs so Well

Simplex C-L-X is a packaged combination of cable and an extremely pliable, corrugated metal sheath. It requires no separate duct or conduit regardless of environment. It is available with steel sheath and plastic jacketing; and with copper or aluminum sheaths, with or without plastic jacketing.

C-L-X Cuts Installation Costs

By using a single length of 3-conductor 15KV C-L-X for both underground and aerial use, a Southeastern utility company saved more than 20,000 dollars from what it would have cost for a complete underground duct system.

Resists Chemical Attack

Conduit life in this company's calcium chloride reclamation building was only 6 to 9 months. The conduit was replaced with a C-L-X cable system which — after two years of operation, shows no signs of deterioration.

Protects Against Liquids and Gases

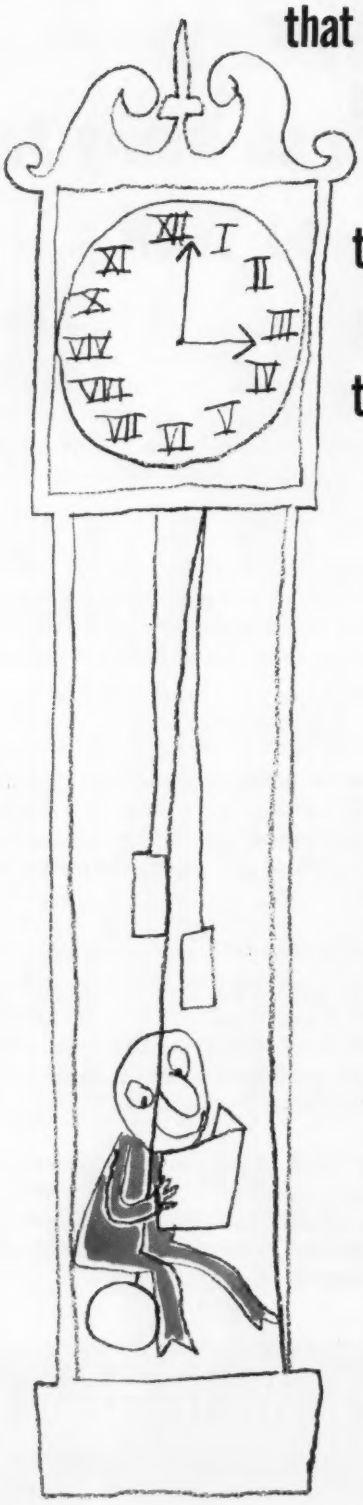
An East Coast petroleum tank farm used a C-L-X 8-conductor cable protected with PVC for direct burial in ground that was saturated with oil, gas and water. Result: Perfect performance at a sizeable savings over conduit systems.

Only Simplex C-L-X offers you: Exceptional Strength . . . Unequalled Pliability . . . Protection from Liquids and Gases . . . Faster Installation and Lower Costs. Send for Illustrated Brochure containing Application and Engineering Data.

SIMPLEX WIRE & CABLE Co

CAMBRIDGE, MASSACHUSETTS

Why is it that the really busiest men always seem to have the most time to read?



Not long ago, we talked with the president of a huge international organization . . . an executive who commands more than fifty companies in 29 countries. He confessed to being an ardent reader of a certain McGraw-Hill magazine.

"When in the world do you ever find time to read it?" we asked him. "Why, it's right here in my briefcase," he said, and he reached over and pulled it out.

This shouldn't startle you. Important men recognize their responsibility to keep informed . . . make time in a businesslike way to read their own so pertinently edited McGraw-Hill publication. Instinctively they know that success, stature and specialized knowledge are bedfellows.

How well are you reading this, your own magazine? Are you a "skimmer" or a bonafide reader? There's more for you here than meets the eye . . . if you'll give your eye a real chance to explore.

And how about others in your department? Surely, there must be some qualified men-on-the-way-up whom you could help by passing along this issue . . . and with this particular page well marked. Wouldn't you like them to know, as you know, that . . .

Men who read more . . . earn more!

Company Briefs

McLanahan & Stone Corp., Hollidaysburg, Pa., in 1958 completed an expansion program which tripled fabricating and assembling facilities. The company now reports another addition of 65% to the present plant area completed last November. At the same time, a new Testing Laboratory (photo) has been added to be used for evaluation of materials samples in order to arrive at accurate determinations for size, capacity and types of equipment to be recommended for processing of different products.

Cate-Carbon Equipment Co., Price, Utah, has been named mining tool distributor for Carmet, the carbide producing facility of **Allegheny Ludlum Steel Corp.**, Pittsburgh, Pa. Cate-Carbon has complete sales and service to the coal mines in southeast Utah.

Atlas Equipment Co., Salt Lake City, Utah, has been appointed dealer for P&H construction and mining equipment manufactured by **Harnischfeger Corp.** of Milwaukee, Wis. The new dealership will cover a territory including all of Utah, southeast Idaho and southwest Wyoming. **D. Patrick Shanahan,** manager of Harnischfeger's Denver district office, will assist Atlas Equipment.

J. H. Fletcher & Co., Huntington, W. Va.; **Wilson Brothers,** Nelsonville, Ohio; and **Clark Equipment Co., Inc.**, Little Rock, Ark.; have been appointed authorized distributors for **Vascoloy-Ramet** mining tools.

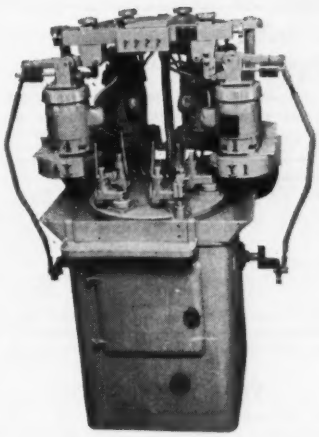
J. Schonthal & Associates, Inc., Chicago, Ill., has been named sales and service representative in Illinois, Indiana and west Kentucky, for the Ratio-Feeder manufactured by the Mining Equipment Div. of **Columbus McKinnon Corp.**, Tonawanda, N. Y.

Vascoloy-Ramet Corp. has announced the opening of a branch office and warehouse at Pineville, W. Va. **Gaylord L. Short** will operate the office under direct supervision of **Dillon Smith,** sales supervisor for the West Virginia area.

Joy Mfg. Co. has announced that all coal machinery sales in Montana, Wyoming, Utah, Colorado and New Mexico will be handled by **Schloss & Shubart, Inc.** of Denver.

Cut Bit Grinding Costs!

. . . and get these extra benefits



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- ★ **Better Performance**
- ★ **Uniform Results**
- ★ **Maximum Bit Life**
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All of these advantages boil down to savings of both labor and wheels, productivity of 250 to 350 per hour, correct angles – smooth finish, more regrinds, more grinds per bit, more tons per grind and elimination of hazardous operation. It's to your advantage to use the FAIRVIEW BIT GRINDER both in the satisfactory grinding results obtained and in the protection of your investment in expensive equipment.

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Is the gripper or flange design right for your vibrating equipment? Are the flanges held parallel? Is the radius of the flange hook correct? Does the cloth lie flat? Are the ledges clean? Is the tension drawn on the screen section squarely? Check these points carefully to correct gripper edge problems. Call Cleveland Wire Cloth for valuable assistance and top quality vibrating screen section cloth.

Write for ***FREE*** maintenance-reducing check sheet today.

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Inter-communication handsets, two wire system. Included Two 3 volt batteries, 50 ft. of wire and simple wiring instructions. Additional wire 1 cent per ft. or $25.00 per mile. Complete list of telephone parts, handsets, magneto—common battery — and dial telephones, switchboards, etc. All shipments FOB Simpson, Penna.
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Check our listing of modern mechanical equipment—whether to completely mechanize or further mechanize your operation—we offer the most complete stock of used and rebuilt machinery.

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IF WE ADVERTISE IT — WE OWN IT

A. C. MINING EQUIPMENT FOR SALE

2—12G-3 Goodman Cutting Machines, A.C.
2—11BU-10APH Joy Loading Machines, 220/440 Volts A.C.
2—4JCM Joy Continuous Miners, 440 Volts A.C.
3—7B Sullivan Cutting Machines, 220/440 Volts A.C.
1—T-1 Joy Machine Truck, A.C.
1—T2-5 Joy Machine Truck, A.C.

LOADING MACHINES FOR SALE

1—18 HR Joy Loading Machine. 250 Volts D.C.
4—11 BU-10APE Joy Loading Machines, 250 Volts D.C.
1—14 BU-7BE Joy Loading Machine, 250 Volts D.C.
1—14 BU-3PE Joy Loading Machines, 250 Volts D.C.
6—12 BU-9E Joy Loading Machines, 250 Volts D.C.
4—8 BU Joy Loading Machines, 250 Volts D.C.
3—7 BU Joy Loading Machines, 250 Volts D.C.
2—Long 12″ Piggyback Conveyors, each 300′ long, complete with PT-12 Piggybacks and 12BU Joy Loading Machines.
2—14BU-7RBE Joy Loading Machines, 250 Volts, DC, excellent condition.
1—14 BU-7RAE Joy Loading Machine, 250 Volts D.C.

SHUTTLE CARS FOR SALE

2—32E-16 Joy Shuttle Cars, 250 Volts D.C.
1—570-48 Goodman Shuttle Car, 250 Volts, D.C.
1—5SC Joy Shuttle Car, Elevating Discharge, Disc Brakes, 250 Volts D.C.—Modern.
2—6SC-5E Joy Shuttle Cars, Elevating Discharge, 4-Wheel Steering. 250 Volts D.C.
3—42E18 Joy Shuttle Cars, Disc Brakes, Elevating Discharge, Completely Modern, 250 Volts, D.C. 2-Standard, 1-Opposite Standard Drive.
2—32 E-7 Joy Shuttle Cars.
1—10SC-2BPXE Joy Shuttle Car, Permissible, equipped with 40J, 15 HP Motors.
4—10SC Joy Shuttle Cars, 500 Volts DC.

CUTTING MACHINES FOR SALE

2—29LC Jeffrey Cutting Machines, 250 Volts D.C.
1—512 CJ Goodman Cutting Machine, 50 H.P. with bugduster.
2—10RU Joy Cutting Machines, 250 Volt D.C. with bugduster.
2—29UC Jeffrey Universal Cutters, Permissible, 250 Volts D.C.
1—512 CCH Goodman Cutting Machine, 250 Volts D.C.
5—35B Jeffrey Cutting Machines, 250 Volts D.C.
6—35BB Jeffrey Cutting Machines, 250 Volts D.C.
1—512DA Goodman Cutting Machines, 250 Volts D.C.
2—7AU Sullivan Cutting Machines, 250 Volts D.C.
3—212 AB Goodman Machines.
2—412—AA Goodman Machines.
6—35L Jeffrey Machine.
1—11RU Joy Cutting Machine, 250 Volt D.C.
1—70-URB Jeffrey Cutting Machine, 250 Volts D.C.
2—512 EJH Goodman Cutting Machines.

CONTINUOUS MINERS FOR SALE

2—1CM Joy Continuous Miners, 250 Volts D.C.
3—4JCM Continuous Miners, 440 Volts A.C.
1—5 JCM Joy Continuous Miner with self-tramming and extensive belt, 440 Volt AC, complete with 1000 feet of structure and belting wih bridge conveyor between miner and belt.

RECTIFIERS FOR SALE

1—400 KW American Selenium Rectifier, 4160 Volts Primary, 275 Volts D.C.

ROTARY CONVERTERS FOR SALE

1—300 KW Westinghouse, Pedestal Type Converter, 275 Volts D.C., Primary 2300/4000.
1—150 KW Rotary Converter, Serial No. 1054562, with 150 KVA transformer and panel boards.
1—100 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.
1—150 KW Westinghouse Rotary Converter, Pedestal Type, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C.
1—200 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.

COAL DRILLS FOR SALE

1—Chicago Pneumatic RBD-30 Roof Drill.
25—CP-472 Electric Coal Drills, 250 Volts D.C.
5—CP-572 Coal Drills.
10—Chicago Pneumatic Little Giant 572 Coal Drills, 3 phase, 220 Volt A.C., permissible, New.
4—CD-25 Coal Drills, 250 Volts D.C.

CRUSHERS FOR SALE

1—Cedar Rapids 20″ x 30″ Swing Hammer Crusher.
1—36″ x 36″ Double Roll Crusher, complete with 100 H.P. Motor.
1—Robins 36″ x 36″ Double Roll Stoker Crusher, specially built with spike teeth equipped with extra set of new segments.
1—Pennsylvania Single Roll Crusher, 24 x 40.

COMPRESSORS FOR SALE

1—Joy WK-85 Air Compressor, Serial No. 53661, rubber mounted, self-propelled, 28½″ high, Model 240, maximum pressure 100 lbs.
2—Acme Self-propelled Air Compressors, 83R. Model 168, Capacity 176CFM, with 40 H.P. Reliance Compound Motor. Excellent Condition.

LOCOMOTIVES FOR SALE

1—MH-88 Jeffrey Locomotive, 30″ high with CY-21 Reel, 44″ track gauge.
1—MH-150 Jeffrey Locomotive, 42″ track gauge, 250 Volts D.C., 26½″ high, rebuilt.
1—General Electric 6 Ton Locomotive with Reel, 36″ gauge.
1—1030 Goodman Locomotive, 24″ high, 44″ track gauge.

ROCK DUSTERS FOR SALE

1—MSA Track Mounted Rock Duster, 10 H.P., A.C., or D.C., high pressure, 30″ high, any gauge.
2—MSA Bantam Rock Dusters, Rubber Tired, Portable.
2—MSA Bantam Rock Dusters, Skid Mounted.
1—American Mine Door. Wheel mounted bantam type rock duster, 250 Volts D.C., 22″ high.

HOISTS FOR SALE

2—Brownie Hoists, 5 H.P., A.C.
10—#11½ Vulcan-Denver Material Hoists, Complete with 3 H.P. D.C. Compound Wound 1750 RPM General Electric Motor.
1—Brownie Hoist. Model HKM—Good condition.
3—Sullivan Type CHL. 5 H.P., Car Spotting Hoists.
2—Joy CHD Hoists, 10 H.P.

ELEVATORS FOR SALE

2—Joy PL11-16 Elevating Conveyors.

MACHINE TRUCKS FOR SALE

1—T2-5APE Joy Machine Truck, 250 Volts, D.C., equipped with hydraulic system for drill.
4—T2-5APE Joy Trucks, 250 Volts D.C. Permissible.

CHAIN CONVEYORS FOR SALE

5—61AM Jeffrey Chain Conveyors, 10 H.P. 300′ long.
3—61HG Jeffrey Chain Conveyors, 5 H.P. 40′ long.
1—Jeffrey 300 ft. 15″ Chain Conveyor.

DIESEL PLANTS FOR SALE

1—60 KW, G.M. Diesel Generator Set, with 60 KW, 250 Volt D.C. Delco Generator.
1—100 KW Waukesha Diesel Generator with 220/440 Volts D.C.
1—100 KW Diesel Generator Unit, with G.M. Diesel Engine and 100 KW Generator.

MOTOR GENERATORS FOR SALE

1—D13000 Caterpillar Diesel Generator Unit—with Caterpillar engine and 75 KVA G.E. generator self-regulating, 220 Volt A.C.
1—150 KW General Electric Motor Generator Set, 2300 Primary, 275 Volts D.C.
1—150 KW General Electric Motor Generator Set, 440 Volts A.C. Primary, 275 Volts D.C.
1—50 KW Westinghouse MG Set, 440 Volt A.C., 250 Volt D.C.
1—300 KW Westinghouse Motor Generator Set, synchronous motor, 433 KW Output, 435 KVA, 2200 Volts, 1200 RPM. Compound Wound. Complete with D.C. panel and switch gear.
3—50 KW G.E. and Westinghouse Motor Generator Sets, 2300 Volts A.C., 275 Volts D.C. Complete with switching gear.
1—200 KW Ridgeway Motor Generator Set, Complete with switchgear and 1600 amp. I-T-E automatic circuit breaker, 2300 A.C., 275 Volts D.C.

BELT CONVEYORS FOR SALE

300 ft. Joy 15″ Pans and Chains.
700 ft. Goodman 30″, 97C Structure complete with drive.
1 only 1200′ 26″ Belt Conveyors with 30 H.P. 250 Volt D.C. Drives.
1—36″ Joy Self-Tramming Extensible Belt, 1200 ft. long with belt and drive.
1—30″ Joy Self-Tramming Extensible Belt, 1000 ft. long with belt and drive.
1—Barber Greene Conveyor (lattice type) complete with 24″ belt and drive.

ROOF BOLTING MACHINES FOR SALE

4—Fletcher Roof Bolting Machines; with permissible dust collectors.

THE FOLLOWING OFFERED AS A PACKAGE UNIT ONLY

1—5CM Joy Continuous Miner, 440 Volts A.C.
2—16SC Joy Shuttle Cars, matched pair, 440 Volts A.C.

MISCELLANEOUS FOR SALE

1—Compton Model 56 Auger with 300 H.P. Cummins Diesel Engine Drive, 210 feet 38″ diameter auger (6 sections—35 feet each); 1—42″ cutter head, 70 feet, 48″ diameter auger (2 sections—35 feet each); 1—52″ cutter head.
1—300 KVA Underground Transformer, skid mounted, 40″ high.
3—75 KVA Underground Transformers, skid mounted 40″ high.
3—30 KVA Underground Transformers, skid mounted, 40″ high.
2—3 H.P. Gear Motors with 15″ head and tail assemblies.
2—5 H.P. Gear Motors with 15″ head and tail assemblies.
3—75 KVA Transformers, 2300/4000 Wye to 220 Volts.
3—35B Jeffrey Armatures. 250 Volts D.C.
4—902, 250 Volts D.C. Westinghouse Motor Units, only.
1—PL 11-14 Joy Elevator.
10—Goodman 512 Cutter Bars and Chains.
173—AC&F 42″ Gauge. 48″ high Drop Bottom Mine Cars. Condition like new.
1—24″ Fan with drive.
2—7½ H.P. Tricycle Type Rubber Tired Mine Tractors, 7½ H.P. 220 Volt Single Phase Motors or 250 Volt D.C. Motors.
3—24 J Motors. 7½ H.P. 250 Volt D.C.
2—42″ Track Gauge Phillips Carriers.
1—Manson Mine Jeep 40″ Track Gauge equipped with 9J Motor.
10,000 ft.—1,000,000 CM Insulated Feeder Cable, Stranded.
5,000 ft.— 500,000 CM Insulated Feeder Cable, Stranded.
Large quantities of 40# and 60# ASCE Steel.

ALL EQUIPMENT LISTED AND HUNDREDS OF OTHER ITEMS ARE IN STOCK AND MAY BE INSPECTED AT OUR SHOP AND EQUIPMENT YARD LOCATED AT RALEIGH, WEST VIRGINIA

MOUNTAIN STATE EQUIPMENT COMPANY

Box 1050, Beckley, West Virginia — **Phone CLifford 3-7383**

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Res. Phone CLifford 3-6804, Beckley

WILLIAM R. MONK
Res. Phone CLifford 3-6907, Beckley

R. E. KAMM
Res. Phone 4281, Summersville

ELECTRIC MACHINE SUPPLY COMPANY

Largest Supplier of the Best Rebuilt Mining Equipment

CONTINUOUS MINERS

1—3 JCM Joy Continuous Miner, 250 V., D.C., Excellent Condition

CUTTING MACHINES

5—12RB Joy Cutting Machines, 250 V. D.C., Permissible, Dual Wheels, Bugdusters, 9′ Bar, Excellent Condition
5—11RU Joy Cutting Machines, 250 V. D.C., Permissible, Bugdusters, one completely rebuilt
1—70 URB Jeffrey Cutting Machine, 250 V., D.C., Excellent Condition
1—29U Jeffrey Cutting Machine, 220/440 V. A.C., Completely rebuilt
15—512 Goodman Cutting Machines, 250 V., D.C., Hydraulically or Manually Controlled
1—824 Goodman Slabber, 250 V. D.C.
48—35B and 35BB Jeffrey Cutting Machines, A.C. and D.C.
6—7AU Sullivan Cutting Machines, 250 V. D.C.
5—7B Sullivan Cutting Machines, 250 V. D.C.
16—11B Sullivan Cutting Machines, 35 & 50 h.p., 250 V. D.C.
18—12AB, 12AA and 112AA Goodman Cutting Machines, 250 V. D.C.
9—212AA Baby Goodman Cutting Machines, 250 V. D.C.

BELT CONVEYORS

1—36″ Joy Model "C" Belt Conveyor, 1,080′ centers
7—MTB 30 Joy Tandem Belt Conveyors, 1,000′ centers, 25, 40 & 50 h.p., one with Scandura Flame Proof Belting
670′—48″ Link Belt Conveyor Structure
1—30″ 97HC Goodman Tandem Belt Conveyor Drive
4,280′—30″ 99-5GT Goodman Belt Conveyor Structure
5—99-5GT Tandem Belt Conveyor Drives
1—30″ Shop Constructed Belt Conveyor Drive
288′—30″ Barber Greene Belt Conveyor Structure
8,760′—26″ Joy Model "C" Structure
18—26″ Belt Conveyor Drives, various makes

LOADING MACHINES

3—11BU Joy Loaders, 250 V. D.C.
4—8BU Joy Loaders, A.C. & D.C., rebuilt
2—14BU-7RAE Joy Loaders, 250 V. D.C.
1—14BU-7BE Joy Loaders, 250 V. D.C.
6—14BU-3PE Joy Loaders, 250 V. D.C.
4—14BU-2E Joy Loaders, 250 V. D.C., 28″ O. H.
3—12BU-9E Joy Loaders, 250 V. D.C., rebuilt
4—20BU Joy Loaders, 250 V. D.C., Permissible
1—36D Goodman Loader, on rubber, 250 V. D.C.
5—Long 88 Pig Loaders, 250 V. D.C.
1—24BB Clarkson Loader, 250 V. D.C.

SHUTTLE CARS

8—60E-10 Joy Shuttle Cars, w/Elevators, matched pairs, 250 V. D.C.
10—42E Joy Shuttle Cars, 250 V. D.C.
5—5SC Joy Shuttle Cars, w/Elevators, 250 V. D.C.
19—6SC Joy Shuttle Cars, matched pairs, 250 V. D.C.
2—8SC Joy Shuttle Cars, Elevating Discharge, Permissible Plates, Excellent Condition, 250 V. D.C.
17—32E-10 & 32E-16 Joy Shuttle Cars, Excellent Condition, 250 V. D.C.
1—32D Joy Shuttle Car, complete w/batteries
2—MT66-A45 Jeffrey Shuttle Cars, 250 V. D.C., matched pair, Excellent Condition

MISCELLANEOUS TRACKLESS EQUIPMENT

1—WK-83R Joy Compressor, 240 cu. ft.
1—WL-82 Joy Compressor, 125 cu. ft.
5—T2-5AE & T2-2E Joy Machine Trucks
2—T14G Joy Machine Trucks, 220 V. A.C.
1—Lot 9J, 10J, 23J and 24J Motors

PREPARATION EQUIPMENT

1—4 Cell Jeffrey Baum Jig Washer, complete, 300 t.p.h. capacity
1—Simon Carver Heavy Duty 2 compartment Baum Jig, 400 t.p.h. capacity
1—Daniels Heavy Media Washer
1—48″ CMI Centrifugal Dryer
1—Heat Dryer, complete
1—36″ x 130′ Hot Material Handling Belt, Excellent
4—7′ x 15′ Single Deck Diester Tables
1—36″ x 36″ Jeffrey Single Roll Crusher
1—36″ x 33″ Marion Double Roll Primary Crusher
1—300 x 36″ Jeffrey Double Roll Crusher, Like New
1—30″ x 30″ Link Belt Double Roll Crusher
1—24″ x 50″ Pa. Single Roll Crusher
2—24″ x 24″ Jeffrey Single Roll Crushers
1—2′ x 4′ Williams Pulverizer
1—18″ x 24″ McClanahan & Stone Single Roll Crusher
1—18″ x 12″ Jeffrey Swing Hammer Pulverizer
1—6′ x 16′ Allis Chalmers Double Deck Low Head Vibrator
1—6′ x 14′ Single Deck Allis Chalmers Low Head Vibrator, Like New
1—5′ x 16′ Triple Deck Allis Chalmers Ripl-Flo Vibrator, Like New
1—5′ x 16′ Single Deck Allis Chalmers Low Head Vibrator, Like New
2—5′ x 12′ Allis Chalmers Single Deck Low Head Vibrators
1—5′ x 12′ Allis Chalmers Ripl-Flo Double Deck Vibrator
1—5′ x 10′ Double Deck Robbins-Gyro Vibrator, Like New
1—4′ x 12′ Hewitt Robbins Vibrex Screen, Triple Deck
5—4′ x 7′ Jeffrey Traylor Double Deck Vibrators
2—4′ x 7′ Jeffrey Traylor Single Deck Vibrators
1—3′ x 4′ Single Deck Gyro Vibrator
2—3′ x 8′ Low Head Vibrators
1—30″ x 72″ Jeffrey Traylor Double Deck Vibrator
1—2′ x 5′ Lecco Single Deck Vibrator
1—2′ x 5′ Selectro Double Deck Vibrator
9—24″ x 90″ Jeffrey Traylor Vibrators, w/M.G. Sets
2—Magnetic Separators. Complete
1—Set Jeffrey Dewatering Screens
13—Scraper Conveyors of various sizes
14—Drag Conveyors of various sizes
1—970′ Jeffrey Rope & Button Conveyor
13—Boom Hoists from 1 ton to 5 ton
We can construct loading booms and tipple belts in any size.

CHAIN AND SHAKER CONVEYORS

20″ Joy Chain Conveyors, A.C. & D.C., Permissible
15″ Chain Conveyor Drives, A.C. & D.C., Permissible
15″ Long Chain Conveyors, A.C. & D.C.
12″ & 15″ Jeffrey Chain Conveyors
12″ Goodman Chain Conveyors
PT12 Long Piggyback Conveyors
PT12-B Long Piggyback Conveyors
Goodman G12½, G15, & G20 Shaker Conveyor Drives
Joy Ladel UN17 Shaker Conveyor Drives
Goodman Power Duckbill & Duckbill Hoists

LOCOMOTIVES

4—20 Ton Jeffrey MH77 Locomotives, 42″ & 48″ t.g.
1—15 Ton HM828 G.E. Locomotive, 90 h.p. units, 44″ O.H., 48″ t.g., Excellent
1—14 Ton MH110 Jeffrey, 42″ t.g.
6—13 Ton Locomotives, 250 V., any gauge
1—12 Ton 29B Goodman Locomotive, 40″ O.H.
11—10 Ton Locomotives, 250 V., any gauge
18—8 Ton Locomotives, 250 V., any gauge
8—7 Ton Atlas Battery Locomotives
29—6 Ton Locomotives, any gauge
3—6 Ton Jeffrey MH150 Locomotives
15—6 Ton MH88 Jeffrey Locomotives
9—5 Ton Locomotives, 250 V.
17—4 Ton Locomotives, 250 V., any gauge
1—4 Ton G.E. Battery Locomotive, 48″ t.g.
2—4 Ton Mancha Battery Locomotive, 48″ t.g.

SUB STATIONS & TRANSFORMERS

1—Westinghouse A.C. Sub Station, 4500 KVA, 6900/2300, complete w/boards, Excellent
4—300KW M.G. Sets
5—200KW M.G. Sets
4—200KW, HCC-6-1200 G.E. Rotary Converters, Automatic
3—150KW G.E. Rotary Converters, w/Transformers
1—150KW Westinghouse Rotary Converter, completely Automatic
19—150KW M.G. Sets of various makes & voltages
2—100KW M.G. Sets
1—100KW Westinghouse Generator, 250 V. D.C., connected to Buda Diesel Engine, complete w/boards
2—100KW Generators, w/671 G.M. Diesel
1—90KW Generator, w/671 G.M. Diesel, Excellent
1—75KW Generator, w/10019 Diesel Engine
1—75KW Generator, w/75 h.p. G.M. Diesel w/ITE Automatic Control Board
1—100KVA Gasoline Alternator Unit
1—50KW M.G. Set, 125 V. D.C., 1200 rpm
2—Armatures for 200KW Rotary G.E., type HCC
2—600 & 800 Auto Transformers
186—Transformers from 1½KVA to 800KVA, list sent on request.

MINE CARS

90—36″ t.g. Drop Bottom Cars
155—42″ t.g. End Dump Cars, various makes
176—42″ t.g. S. D. Drop Bottom Mine Cars
45—42″ t.g. A.C.F. Drop Bottom Cars
22—44″ t.g. Drop Bottom Cars, 10 ton Capacity
130—44″ t.g. Drop Bottom Cars, various sizes
333—44″ t.g. End Dump Cars, various sizes
327—48″ t.g. S. D. Drop Bottom Cars
259—48″ t.g. A.C.F. Drop Bottom Cars
2—56½″ t.g., 3 Ton, 4 Wheel Push Trucks, (NEW)

RAIL AND WIRE

1,285—Tons 30, 45, 56, 65, 70, 90 & 100 lb Relaying Rail
325′—2,000,000 CM Bare Copper Feeder Cable
3,689′—1,000,000 CM Bare Copper Feeder Cable
7,357′—500,000 CM Bare Copper Feeder Cable
2,000′—2/0 Stranded Copper, Bare
27,600′—1/0 Solid Copper Highline Wire
15,000′—#1 Solid Copper Highline Wire
2,100′—#2 Stranded Copper Highline Wire
164,000′—#2 Solid Copper Highline Wire
2,380′—#4 Solid Copper Highline Wire
3,900′—#6 Solid Copper Highline Wire
4,797′—4/0 Fig. 8 Trolley Wire
38,164′—6/0 Trolley Wire
6,000′—4/0, 3 Cond. rubber covered cable, 5,000 V., Excellent Condition
5,000′—2/0, 3 Cond. Anhydres & Lead covered Transmission Cable
10,000′—#2, 3 Cond. Lead Covered Cable, 5,000 V.
6,200′—#1, 3 Cond. Lead Covered Cable, 5,000 V.
2,500′—1¼″ Steel Cable, New
600′—1⅛″ Steel Cable, New
Several Thousand feet #2, #3 and #4 approved type machine cable

MISCELLANEOUS

1—Canton Track Cleaner, Excellent
17—HKL, HKG, HKD, HKC, HL & CH Brown Fayro & Sullivan Hoists
48—Air Compressors of various sizes
57—Auto Starters from 3 h.p. to 100 h.p.
17,270′—pipe: Galvanized, Plastic & Cast Iron
81—Hoists from 1½ to 800 h.p.
13—Shop Constructed Jeeps, track mounted
7—Hyd. Schroeder Coal Drills
112—Pumps from ¾″ to 4500 GPM
81—Coal Drills, various makes and sizes
1—300 GOM 6″ Pomona Deep Well Pump
1—14″ Centrifugal Slurry Pump
45—Room Blowers: Brown Fayro & Jeffrey
26—Mine Fans from 30″ to 9′ Hi Pressure
17—Battery Chargers, various voltages
11—Rock Dusters up to 30 h.p.
4—Phillips Machine & Shuttle Car Carriers, 36″ to 48″ t.g.
1—42 Ton Richards Truck Scale, 10′ x 25′ Deck
780—Stationary Motors—½ to 800 h.p., A.C. & D.C. (List of motors available upon request)

We have thousands of dollars worth of parts for the equipment listed.

ALL INQUIRIES WILL BE ANSWERED PROMPTLY

WHITESBURG, KENTUCKY
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MOUNTAIN STATE EQUIPMENT COMPANY

Has purchased the St. Ellen Mine of Peabody Coal Company, O'Fallon, Illinois, located on U. S. Route 50, approximately fifteen miles east of St. Louis, Missouri. The entire stock of equipment and approximately 400 acres of land are being offered for sale at bargain prices.

J. J. MAHONEY AND ROY FAIRCHILD CAN BE CONTACTED AT THE MINE SITE AT ALL TIMES

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O'Fallon
Illinois

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MErcury 2-3622
MErcury 2-3623
Night Phone: MErcury 2-5887

THE FOLLOWING IS A PARTIAL LISTING OF EQUIPMENT FOR SALE AT THE MINE SITE

SHUTTLE CARS, 250 VOLTS DC
11—Joy 10SC Shuttle Cars, right and left hand drive.

CUTTING MACHINES, 250 VOLTS DC
5—10RU Joy Cutting Machines.
5—324 AA Goodman Slabbers—Track Gauge 42″.

TROLLEY LOCOMOTIVES, 42″ TRACK GAUGE FOR 250 VOLT DC
1—13 ton Goodman—Type 81A04T, completely modern.
1—Goodman 13 ton 136B-0-4-6 with 2—75 H.P. Motors.
2—13 ton Jeffrey Locomotives (1—inside frame and 1—outside frame).
1—Goodman 5 ton 3013 with 1—50 H.P. Motor
4—8 ton 132AK42-48R Goodman with 2—50 H.P. Motors with reels.
1—8 ton 32-0-4-T Goodman with 2—50 H.P. Motors with reels.
1—8 ton LM2-8-T.DD General Electric with 2—50 H.P. Motors with reels.
3—6 ton LM2-T-6MM General Electric with 2—35 H.P. Motors with reels.
2—6 ton LM2-4-6-11 General Electric with 2—35 H.P. Motors with reels.

BATTERY LOCOMOTIVES, 42″ TRACK GAUGE
18—Greensburg Monitors complete charging equipment and batteries.
8—Mancha Locomotives complete with charging equipment and batteries.

LOADING MACHINES, 250 VOLTS DC
9—11BU Joy Loading Machines, completely modern with separate pump motors.
6—360 Goodman Loading Machines.

MOTOR GENERATOR SETS
7—General Electric 300 KW Motor Generator Sets, 1200 RPM, primary voltage 2300/4160, 275 Volts DC, complete with panel boards.
3—General Electric 200 KW Motor Generator Sets, primary voltage 2300/4160, 1200 RPM, 275 Volts DC, complete with panel boards.
1—Westinghouse 200 KW Motor Generator Set, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.
2—Westinghouse 150 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

CONVEYORS
5—Joy PL 11 Elevating Conveyors.
6—Joy PL 11 Side Dumps.

BELT CONVEYORS
1—Hewitt-Robins Slope Conveyor, 980 ft. long, 42″ wide, equipped with 200 H.P. 440 Volt AC Drive (also 50 H.P. 440 Volt AC Motor for man trip), complete with 42″ x 6 ply Rubber Conveyor Belt, Ajax Raynile #130 1/4″ top cover and 1/16″ bottom cover with Nylon Breaker.
2,128 feet of Jeffrey 36″ wide structure in 8 ft. sections.
4,000 feet of Rubber Belt 36″ wide.
1—40 H.P. Goodman 36″ Belt Drive with Tail, 250 Volts DC.
1—Robins Belt Conveyor 36″ wide, 150 ft. long complete with Allis-Chalmers, 30 H.P., 220/440 Volt AC Drive.

MINE CARS
100—AC&F, Three-Door Drop Bottom Mine Cars, 48″ High, 17 ft. 7 1/4 in. overall length, capacity 271 cubic feet level full, 42″ gauge.
100—Sanford-Day Three-Door Drop Bottom Mine Cars, 36″ high with an 8″ sideboard, 16 ft. 10 1/2″ overall length, 42″ gauge.

WIRE MATERIAL
21,400 ft.—4/0 Round Return Wire.
8,600 ft.—500,000 CM.
50,000 ft.—1,000,000 CM.
82,600 ft.—6/0 Trolley Wire.
8,000 ft.—4/0 Rubber Covered 4000 Volt Feeder Cable.

TRACK MATERIAL
64,800 ft.—40# Track.
154—40# Switches.
10,800—40# Ties.
100,400 ft.—60# Track.
51—60# Switches.
7,000—60# Ties.

COMPLETE FOUR-TRACK TIPPLE CAPABLE OF HANDLING 10,000 TONS OF COAL PER DAY PARTIAL LIST OF MAOJR ITEMS OF TIPPLE:
Sizes of coal: from 1/4 x 0 to 7 x 4″ Block.
CMI 48″ Dryer—complete with motors, drives, belt, etc., screen cloth 1/16″ opening capacity 90 ton per hour.
1—Coppus Ventair Blower #24708.
Pulverizers: (American Pulverizers) 4—# 305, Ser. #3218—AC3, Serial #1798, AC3B, Ser. #3127, WC-24, Ser. #3240.
5—8 x 6 Allis-Chalmers Centrifugal Pumps, complete with motors (4) breakers.
1—15 x 14 Allis-Chalmers Centrifugal Pump, complete with motor, starter, breakers.
1—Roberts & Schaefer Eleptic Vibrator.
1—Roberts & Schaefer Air Drying Plant, complete (specifications furnished on request). Consists of Belt & Chain Conveyers complete with motors, drives, 36″ Belt also some 24″ and 30″ Belt.

WELDERS
1—Lincoln, 300 amp. M.G. Set.
2—Hobart, 300 amp. M.G. Sets.
1—G.E., 400 amp. M.G. Set.
4—Guyan 200 amp. Resistance Welders.

AUTOMATIC RECLOSING BREAKERS
4—1600 amp. I.T.E. Modern with reverse curent relay.

AIRDOX EQUIPMENT
5—Armstrong 60 H.P., AC 440 Volt Compressors.
5—Armstrong Coal Breakers, Model EB-301.
5—G.E. Motors 60 H.P., Type K, Frame 504, 220/400 Volt AC, 1180 RPM.
Auxiliary equipment and controls complete with 16,100 feet of Airdox Pipe.

PORTAFEEDER
1—Nolan Portafeeder.

COAL DRILLS
5—Manson Trucks—10 H.P., DC Tram Motors on 4, 7½ H.P. DC Tram Motors on 1, Joy 9 J Motor with Reduction on 1. Each drill truck has 2 drill arms with 2 Chicago Pneumatic 580 Drills 7½ H.P., DC.
3—Manson Track Trucks, each truck with 2 drill arms & 2—580 drills.
2—Manson Track Trucks, without drills.
9—Dooley Rubber Tired Trucks, equipped with two arms and two 580 drill motors.

ROOF DRILLS
1—Joy RBD-7 with 15 H.P. Reliance Permissible DC and mounted on Manson with 7½ H.P. Westinghouse on Rubber.
1—Jeffrey 56 R.D. with 15 H.P. Motor DC, arm is mounted on Manson Track Truck.
1—Dooley (Rubber Tired) Drill Truck, equipped with Vertical Drilling 580 Drill Motors.

ROCK DUSTERS
1—American Mine Door Road Cleaner.
2—MSA Rock Dusters, 25 H.P. Track.
3—MSA Bantam Rock Dusters, 2 H.P.

TRUCKS
4—(Shop Built) Mobile Repair Trucks.
4—Personnel Jeeps, 42″ Track Gauge.

FANS
1—Jeffrey Aerodyne Fan, Serial No. 8687 complete with G.E. 100 H.P., 440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven.
1—4 ft. Jeffrey Aerodyne Fan complete with 60 H.P., 220/440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline drive, complete with all necessary equipment and controls.

TRANSFORMERS
3—2400/4160 Y, 240-480 Volts, 100 KVA General Electric Single Phase Transformers.
3—2400/4160 Y, 240-480 Volts, 333 KVA General Electric Single Phase Transformers.
3—2300/4160 Y, 230-115 Volts, 200 KVA General Electric Single Phase Transformers.
3—2300/115/230 Volt, 15 KVA General Electric Single Phase Transformers.

SUPPLY HOUSE
Complete inventory of new parts for 10SC, 10RU and 11BU Joy Equipment plus cable, tools, hardware, etc. for operation of mine.

BATHHOUSE EQUIPMENT
355—Baskets with Chains, 20 shower heads and complete equipment for operation of bathhouse.

LAMP HOUSE
360—R4 Lamps complete with necessary charging equipment.
25—Flame Safety Lamps.

MOBILE EQUIPMENT
1—Koehring Heavy Duty Crane—C5521.
1—Shovel Dipper Stock for same—Size 301, Serial No. 61, Length 16 feet—¾ yard dipper.
1—International 1950 Flat Bed Truck Tandem with steel bed and wench, Ser. #3438, 3 axles, weight 18,500 lbs.
1—Hough Pay Loader, Model HF and HFH, Serial No. 81221.
1—Allis-Chalmers Tractor HD9-B27.
1—Allis-Chalmers Tractor Hi Lift—Model HD5, Model #24-27482, Serial No. 22246.
1—Caterpillar Tractor D6, 60″ Gauge, Serial No. 5R4778.
1—Whiting Track Mobile, Serial #TM-209.
1—Roller—W. M. Bros. Boiler Mfg. Co., Model 678, Ser. #RR-2734, weight 2950 lbs.

COMPLETE SHOP AND OFFICE EQUIPMENT

STATIONARY MOTORS
AC and DC Motors ranging from 1 to 300 H.P.

GENERAL MISCELLANEOUS
Hundreds of other items such as pumps, motors, armatures, locomotive trucks, wheel units, hydraulic pumps, conveyor chains, cat chains, tipple draglines, etc., too numerous to list.

MOUNTAIN STATE EQUIPMENT COMPANY

Box 1050, Beckley, West Virginia — Phone CLifford 3-7383

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CLifford 3-6804, Beckley

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COAL AGE

ELECTRIC MACHINE SUPPLY COMPANY

Largest Supplier of the Best Rebuilt Mining Equipment

CONTINUOUS MINERS

1—3 JCM Joy Continuous Miner, 250 V., D.C., Excellent Condition

CUTTING MACHINES

5—12RB Joy Cutting Machines, 250 V. D.C., Permissible, Dual Wheels, Bugdusters, 9′ Bar, Excellent Condition
5—11RU Joy Cutting Machines, 250 V. D.C., Permissible, Bugdusters, one completely rebuilt
1—70 URB Jeffrey Cutting Machine, 250 V., D.C., Excellent Condition
1—29U Jeffrey Cutting Machine, 220/440 V. A.C., Completely rebuilt
15—512 Goodman Cutting Machines, 250 V., D.C., Hydraulically or Manually Controlled
1—824 Goodman Slabber, 250 V. D.C.
48—35B and 35BB Jeffrey Cutting Machines, A.C. and D.C.
6—7AU Sullivan Cutting Machines, 250 V. D.C.
5—7B Sullivan Cutting Machines, 250 V. D.C.
16—11B Sullivan Cutting Machines, 35 & 50 h.p., 250 V. D.C.
18—12AB, 12AA and 112AA Goodman Cutting Machines, 250 V. D.C.
9—212AA Baby Goodman Cutting Machines, 250 V. D.C.

BELT CONVEYORS

1—36″ Joy Model "C" Belt Conveyor, 1,080′ centers
7—MTB 30 Joy Tandem Belt Conveyors, 1,000′ centers, 25, 40 & 50 h.p., one with Scandura Flame Proof Belting
670′—48″ Link Belt Conveyor Structure
1—30″ 97HC Goodman Tandem Belt Conveyor Drive
4,280′—30″ 99-5GT Goodman Belt Conveyor Structure
5—99-5GT Tandem Belt Conveyor Drives
1—30″ Shop Constructed Belt Conveyor Drive
288′—30″ Barber Greene Belt Conveyor Structure
8,760′—26″ Joy Model "C" Structure
18—26″ Belt Conveyor Drives, various makes

LOADING MACHINES

3—11BU Joy Loaders, 250 V. D.C.
4—8BU Joy Loaders, A.C. & D.C., rebuilt
2—14BU-7RAE Joy Loaders, 250 V. D.C.
1—14BU-7BE Joy Loaders, 250 V. D.C.
6—14BU-3PE Joy Loaders, 250 V. D.C.
4—14BU-2E Joy Loaders, 250 V. D.C., 28″ O. H.
3—12BU-9E Joy Loaders, 250 V. D.C., rebuilt
4—20BU Joy Loaders, 250 V. D.C., Permissible
1—360 Goodman Loader, on rubber, 250 V. D.C.
5—Long 88 Pig Loaders, 250 V. D.C.
1—24BB Clarkson Loader, 250 V. D.C.

SHUTTLE CARS

8—60E-10 Joy Shuttle Cars, w/Elevators, matched pairs, 250 V. D.C.
10—42E Joy Shuttle Cars, 250 V. D.C.
5—5SC Joy Shuttle Cars, w/Elevators, 250 V. D.C.
19—6SC Joy Shuttle Cars, matched pairs, 250 V. D.C.
2—8SC Joy Shuttle Cars, Elevating Discharge, Permissible Plates, Excellent Condition, 250 V. D.C.
17—32E-10 & 32E-16 Joy Shuttle Cars, Excellent Condition, 250 V. D.C.
1—32D Joy Shuttle Car, complete w/batteries
2—MT66-A45 Jeffrey Shuttle Cars, 250 V. D.C., matched pair, Excellent Condition

MISCELLANEOUS TRACKLESS EQUIPMENT

1—WK-83R Joy Compressor, 240 cu. ft.
1—WL-82 Joy Compressor, 125 cu. ft.
5—T2-5AE & T2-2E Joy Machine Trucks
2—T14G Joy Machine Trucks, 220 V. A.C.
1—Lot 9J, 10J, 23J and 24J Motors

PREPARATION EQUIPMENT

1—4 Cell Jeffrey Baum Jig Washer, complete, 300 t.p.h. capacity
1—Simon Carver Heavy Duty 2 compartment Baum Jig, 400 t.p.h. capacity
1—Daniels Heavy Media Washer
1—48″ CMI Centrifugal Dryer
1—Heat Dryer, complete
1—36″ x 130′ Hot Material Handling Belt, Excellent
4—7′ x 15′ Single Deck Diester Tables
1—36″ x 36″ Jeffrey Single Roll Crusher
1—36″ x 33″ Marion Double Roll Primary Crusher
1—300 x 36″ Jeffrey Double Roll Crusher, Like New
1—30″ x 30″ Link Belt Double Roll Crusher
1—24″ x 50″ Pa. Single Roll Crusher
2—24″ x 24″ Jeffrey Single Roll Crushers
1—2′ x 4′ Williams Pulverizer
1—18″ x 24″ McClanahan & Stone Single Roll Crusher
1—18″ x 12″ Jeffrey Swing Hammer Pulverizer
1—6′ x 16′ Allis Chalmers Double Deck Low Head Vibrator
1—6′ x 14′ Single Deck Allis Chalmers Low Head Vibrator, Like New
1—5′ x 16′ Triple Deck Allis Chalmers Ripl-Flo Vibrator, Like New
1—5′ x 16′ Single Deck Allis Chalmers Low Head Vibrator, Like New
2—5′ x 12′ Allis Chalmers Single Deck Low Head Vibrators
1—5′ x 12′ Allis Chalmers Ripl-Flo Double Deck Vibrator
1—5′ x 10′ Double Deck Robbins-Gyro Vibrator, Like New
1—4′ x 12′ Hewitt Robbins Vibrex Screen, Triple Deck
5—4′ x 7′ Jeffrey Traylor Double Deck Vibrators
2—4′ x 7′ Jeffrey Traylor Single Deck Vibrators
1—3′ x 4′ Single Deck Gyro Vibrator
2—3′ x 8′ Low Head Vibrators
1—30″ x 72″ Jeffrey Traylor Double Deck Vibrator
1—2′ x 5′ Lecco Single Deck Vibrator
1—2′ x 5′ Selectro Double Deck Vibrator
9—24″ x 90″ Jeffrey Traylor Vibrators, w/M.G. Sets
2—Magnetic Separators. Complete
1—Set Jeffrey Dewatering Screens
13—Scraper Conveyors of various sizes
14—Drag Conveyors of various sizes
1—970′ Jeffrey Rope & Button Conveyor
13—Boom Hoists from 1 ton to 5 ton
We can construct loading booms and tipple belts in any size.

CHAIN AND SHAKER CONVEYORS

20″ Joy Chain Conveyors, A.C. & D.C., Permissible
15″ Chain Conveyor Drives, A.C. & D.C., Permissible
15″ Long Chain Conveyors, A.C. & D.C.
12″ & 15″ Jeffrey Chain Conveyors
12″ Goodman Chain Conveyors
PT12 Long Piggyback Conveyors
PT12-B Long Piggyback Conveyors
Goodman G12½, G15, & G20 Shaker Conveyor Drives
Joy Ladel UN17 Shaker Conveyor Drives
Goodman Power Duckbill & Duckbill Hoists

LOCOMOTIVES

4—20 Ton Jeffrey MH77 Locomotives, 42″ & 48″ t.g.
1—15 Ton HM828 G.E. Locomotive, 90 h.p. units, 44″ O.H., 48″ t.g., Excellent
1—14 Ton MH110 Jeffrey, 42″ t.g.
6—13 Ton Locomotives, 250 V., any gauge
1—12 Ton 29B Goodman Locomotive, 40″ O.H.
11—10 Ton Locomotives, 250 V., any gauge
18—8 Ton Locomotives, 250 V., any gauge
8—7 Ton Atlas Battery Locomotives
29—6 Ton Locomotives, any gauge
3—6 Ton Jeffrey MH150 Locomotives
15—6 Ton MH88 Jeffrey Locomotives
9—5 Ton Locomotives, 250 V.
17—4 Ton Locomotives, 250 V., any gauge
1—4 Ton G.E. Battery Locomotive, 48″ t.g.
2—4 Ton Mancha Battery Locomotive, 48″ t.g.

SUB STATIONS & TRANSFORMERS

1—Westinghouse A.C. Sub Station, 4500 KVA, 6900/2300, complete w/boards, Excellent
4—300KW M.G. Sets
5—200KW M.G. Sets
4—200KW, HCC-6-1200 G.E. Rotary Converters, Automatic
3—150KW G.E. Rotary Converters, w/Transformers
1—150KW Westinghouse Rotary Converter, completely Automatic
19—150KW M.G. Sets of various makes & voltages
2—100KW M.G. Sets
1—100KW Westinghouse Generator, 250 V. D.C., connected to Buda Diesel Engine, complete w/boards
2—100KW Generators, w/671 G.M. Diesel
1—90KW Generator, w/671 G.M. Diesel, Excellent
1—75KW Generator, w/10019 Diesel Engine
1—75KW Generator, w/75 h.p. G.M. Diesel w/ITE Automatic Control Board
1—100KVA Gasoline Alternator Unit
1—50KW M.G. Set, 125 V. D.C., 1200 rpm
2—Armatures for 200KW Rotary G.E., type HCC
2—600 & 800 Auto Transformers
186—Transformers from 1½KVA to 800KVA, list sent on request.

MINE CARS

90—36″ t.g. Drop Bottom Cars
155—42″ t.g. End Dump Cars, various makes
176—42″ t.g. S. D. Drop Bottom Mine Cars
45—42″ t.g. A.C.F. Drop Bottom Cars
22—44″ t.g. Drop Bottom Cars, 10 ton Capacity
130—44″ t.g. Drop Bottom Cars, various sizes
333—44″ t.g. End Dump Cars, various sizes
327—48″ t.g. S. D. Drop Bottom Cars
259—48″ t.g. A.C.F. Drop Bottom Cars
2—56½″ t.g., 3 Ton, 4 Wheel Push Trucks, (NEW)

RAIL AND WIRE

1,285—Tons 30, 45, 56, 65, 70, 90 & 100 lb Relaying Rail
325′—2,000,000 CM Bare Copper Feeder Cable
3,689′—1,000,000 CM Bare Copper Feeder Cable
7,357′—500,000 CM Bare Copper Feeder Cable
2,000′—2/0 Stranded Copper, Bare
27,600′—1/0 Solid Copper Highline Wire
15,000′—#1 Solid Copper Highline Wire
2,100′—#2 Stranded Copper Highline Wire
164,000′—#2 Solid Copper Highline Wire
2,380′—#4 Solid Copper Highline Wire
3,900′—#6 Solid Copper Highline Wire
4,797′—4/0 Fig. 8 Trolley Wire
38,164′—6/0 Trolley Wire
6,000′—4/0, 3 Cond. rubber covered cable, 5,000 V., Excellent Condition
5,000′—2/0, 3 Cond. Anhydres & Lead covered Transmission Cable
10,000′—#2, 3 Cond. Lead Covered Cable, 5,000 V.
6,200′—#1, 3 Cond. Lead Covered Cable, 5,000 V.
2,500′—1¼″ Steel Cable, New
600′—1⅛″ Steel Cable, New
Several Thousand feet #2, #3 and #4 approved type machine cable

MISCELLANEOUS

1—Canton Track Cleaner, Excellent
17—HKL, HKG, HKD, HKC, HL & CH Brown Fayro & Sullivan Hoists
48—Air Compressors of various sizes
57—Auto Starters from 3 h.p. to 100 h.p.
17,270′—pipe: Galvanized, Plastic & Cast Iron
81—Hoists from 1½ to 800 h.p.
13—Shop Constructed Jeeps, track mounted
7—Hyd. Schroeder Coal Drills
112—Pumps from ¾″ to 4500 GPM
81—Coal Drills, various makes and sizes
1—300 GOM 6″ Pomona Deep Well Pump
1—14″ Centrifugal Slurry Pump
45—Room Blowers: Brown Fayro & Jeffrey
26—Mine Fans from 30″ to 9′ Hi Pressure
17—Battery Chargers, various voltages
11—Rock Dusters up to 30 h.p.
4—Phillips Machine & Shuttle Car Carriers, 36″ to 48″ t.g.
1—42 Ton Richards Truck Scale, 10′ x 25′ Deck
780—Stationary Motors—½ to 800 h.p., A.C. & D.C. (List of motors available upon request)

We have thousands of dollars worth of parts for the equipment listed.

ALL INQUIRIES WILL BE ANSWERED PROMPTLY

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GORDON STAFFORD

MOUNTAIN STATE EQUIPMENT COMPANY

Has purchased the St. Ellen Mine of Peabody Coal Company, O'Fallon, Illinois, located on U. S. Route 50, approximately fifteen miles east of St. Louis, Missouri. The entire stock of equipment and approximately 400 acres of land are being offered for sale at bargain prices.

J. J. MAHONEY AND ROY FAIRCHILD CAN BE CONTACTED AT THE MINE SITE AT ALL TIMES

P. O. Box 150
O'Fallon
Illinois

Phone: MErcury 2-3621
MErcury 2-3622
MErcury 2-3623
Night Phone: MErcury 2-5887

THE FOLLOWING IS A PARTIAL LISTING OF EQUIPMENT FOR SALE AT THE MINE SITE

SHUTTLE CARS, 250 VOLTS DC
11—Joy 10SC Shuttle Cars, right and left hand drive.

CUTTING MACHINES, 250 VOLTS DC
5—10RU Joy Cutting Machines.
5—324 AA Goodman Slabbers—Track Gauge 42".

TROLLEY LOCOMOTIVES, 42" TRACK GAUGE FOR 250 VOLT DC
1—13 ton Goodman—Type 81A04T, completely modern.
1—Goodman 13 ton 136B-0-4-6 with 2—75 H.P. Motors.
2—13 ton Jeffrey Locomotives (1—inside frame and 1—outside frame).
1—Goodman 5 ton 3013 with 1—50 H.P. Motor
4—8 ton 132AK42-48R Goodman with 2—50 H.P. Motors with reels.
1—8 ton 32-0-4-T Goodman with 2—50 H.P. Motors with reels.
1—8 ton LM2-8-T.DD General Electric with 2—50 H.P. Motors with reels.
3—6 ton LM2-T-6MM General Electric with 2—35 H.P. Motors with reels.
2—6 ton LM2-4-6-11 General Electric with 2—35 H.P. Motors with reels.

BATTERY LOCOMOTIVES, 42" TRACK GAUGE
18—Greensburg Monitors complete charging equipment and batteries.
8—Mancha Locomotives complete with charging equipment and batteries.

LOADING MACHINES, 250 VOLTS DC
9—11BU Joy Loading Machines, completely modern with separate pump motors.
6—360 Goodman Loading Machines.

MOTOR GENERATOR SETS
7—General Electric 300 KW Motor Generator Sets, 1200 RPM, primary voltage 2300/4160, 275 Volts DC, complete with panel boards.
3—General Electric 200 KW Motor Generator Sets, primary voltage 2300/4160, 1200 RPM, 275 Volts DC, complete with panel boards.
1—Westinghouse 200 KW Motor Generator Set, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.
2—Westinghouse 150 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

CONVEYORS
5—Joy PL 11 Elevating Conveyors.
6—Joy PL 11 Side Dumps.

BELT CONVEYORS
1—Hewitt-Robins Slope Conveyor, 980 ft. long, 42" wide, equipped with 200 H.P. 440 Volt AC Drive (also 50 H.P. 440 Volt AC Motor for man trip), complete with 42" x 6 ply Rubber Conveyor Belt, Ajax Raynite #130 1/4" top cover and 1/16" bottom cover with Nylon Breaker.
2,128 feet of Jeffrey 36" wide structure in 8 ft. sections.
4,000 feet of Rubber Belt 36" wide.
1—40 H.P. Goodman 36" Belt Drive with Tail, 250 Volts DC.
1—Robins Belt Conveyor 36" wide, 150 ft. long complete with Allis-Chalmers, 30 H.P., 220/440 Volt AC Drive.

MINE CARS
100—AC&F, Three-Door Drop Bottom Mine Cars, 48" High, 17 ft. 7 1/4 in. overall length, capacity 271 cubic feet level full, 42" gauge.
100—Sanford-Day Three-Door Drop Bottom Mine Cars, 36" high with an 8" sideboard, 16 ft. 10 1/2" overall length, 42" gauge.

WIRE MATERIAL
21,400 ft.—4/0 Round Return Wire.
8,600 ft.—500,000 CM.
50,000 ft.—1,000,000 CM.
82,600 ft.—6/0 Trolley Wire.
8,000 ft.—4/0 Rubber Covered 4000 Volt Feeder Cable.

TRACK MATERIAL
64,800 ft.—40# Track.
154—40# Switches.
10,800—40# Ties.
100,400 ft.—60# Track.
51—60# Switches.
7,000—60# Ties.

COMPLETE FOUR-TRACK TIPPLE CAPABLE OF HANDLING 10,000 TONS OF COAL PER DAY PARTIAL LIST OF MAOJR ITEMS OF TIPPLE:
Sizes of coal: from 1/4 x 0 to 7 x 4" Block.
CMI 48" Dryer—complete with motors, drives, belt, etc., screen cloth 1/16" opening capacity 90 ton per hour.
1—Coppus Ventair Blower #24708.
Pulverizers: (American Pulverizers) 4—# 305, Ser. #3218—AC3, Serial #1798, AC3B, Ser. #3127, WC-24, Ser. #3240.
5—8 x 6 Allis-Chalmers Centrifugal Pumps, complete with motors (4) breakers.
1—16 x 14 Allis-Chalmers Centrifugal Pump, complete with motor, starter, breakers.
1—Roberts & Schaefer Eleptic Vibrator.
1—Roberts & Schaefer Air Drying Plant, complete (specifications furnished on request). Consists of Belt & Chain Conveyors complete with motors, drives, 36" Belt also some 24" and 30" Belt.

WELDERS
1—Lincoln, 300 amp. M.G. Set.
2—Hobart, 300 amp. M.G. Sets.
1—G.E., 400 amp. M.G. Set.
4—Guyan 200 amp. Resistance Welders.

AUTOMATIC RECLOSING BREAKERS
4—1600 amp. I.T.E. Modern with reverse curent relay.

AIRDOX EQUIPMENT
5—Armstrong 60 H.P., AC 440 Volt Compressors.
5—Armstrong Coal Breakers, Model EB-301.
5—G.E. Motors 60 H.P., Type K, Frame 504, 220/400 Volt AC, 1180 RPM.
Auxiliary equipment and controls complete with 16,100 feet of Airdox Pipe.

PORTAFEEDER
1—Nolan Portafeeder.

COAL DRILLS
5—Manson Trucks—10 H.P., DC Tram Motors on 4, 7½ H.P. DC Tram Motors on 1, Joy 9 J Motor with Reduction on 1. Each drill truck has 2 drill arms with 2 Chicago Pneumatic 580 Drills 7½ H.P., DC.
3—Manson Track Trucks, each truck with 2 drill arms & 2—580 drills.
2—Manson Track Trucks, without drills.
9—Dooley Rubber Tired Trucks, equipped with two arms and two 580 drill motors.

ROOF DRILLS
1—Joy RBD-7 with 15 H.P. Reliance Permissible DC and mounted on Manson with 7½ H.P. Westinghouse on Rubber.
1—Jeffrey 56 R.D. with 15 H.P. Motor DC, arm is mounted on Manson Track Truck.
1—Dooley (Rubber Tired) Drill Truck, equipped with Vertical Drilling 580 Drill Motors.

ROCK DUSTERS
1—American Mine Door Road Cleaner.
2—MSA Rock Dusters, 25 H.P. Track.
3—MSA Bantam Rock Dusters, 2 H.P.

TRUCKS
4—(Shop Built) Mobile Repair Trucks.
4—Personnel Jeeps, 42" Track Gauge.

FANS
1—Jeffrey Aerodyne Fan, Serial No. 8687 complete with G.E. 100 H.P., 440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven.
1—4 ft. Jeffrey Aerodyne Fan complete with 60 H.P., 220/440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline drive, complete with all necessary equipment and controls.

TRANSFORMERS
3—2400/4160 Y, 240-480 Volts, 100 KVA General Electric Single Phase Transformers.
3—2400/4160 Y, 240-480 Volts, 333 KVA General Electric Single Phase Transformers.
3—2300/4160 Y, 230-115 Volts, 200 KVA General Electric Single Phase Transformers.
3—2300/115/230 Volt, 15 KVA General Electric Single Phase Transformers.

SUPPLY HOUSE
Complete inventory of new parts for 10SC, 10RU and 11BU Joy Equipment plus cable, tools, hardware, etc. for operation of mine.

BATHHOUSE EQUIPMENT
355—Baskets with Chains, 20 shower heads and complete equipment for operation of bathhouse.

LAMP HOUSE
360—R4 Lamps complete with necessary charging equipment.
25—Flame Safety Lamps.

MOBILE EQUIPMENT
1—Koehring Heavy Duty Crane—C5521.
1—Shovel Dipper Stock for same—Size 301, Serial No. 61, Length 16 feet—¾ yard dipper.
1—International 1950 Flat Bed Truck Tandem with steel bed and wench, Ser. #3438, 3 axles, weight 18,500 lbs.
1—Hough Pay Loader, Model HF and HFH, Serial No. 81221.
1—Allis-Chalmers Tractor HD9-B27.
1—Allis-Chalmers Tractor Hi Lift—Model HD5, Model #24-27482, Serial No. 22246.
1—Caterpillar Tractor D6, 60" Gauge, Serial No. 5R4778.
1—Whiting Track Mobile, Serial #TM-209.
1—Roller—W. M. Bros. Boiler Mfg. Co., Model 678, Ser. #RR-2734, weight 2950 lbs.

COMPLETE SHOP AND OFFICE EQUIPMENT

STATIONARY MOTORS
AC and DC Motors ranging from 1 to 300 H.P.

GENERAL MISCELLANEOUS
Hundreds of other items such as pumps, motors, armatures, locomotive trucks, wheel units, hydraulic pumps, conveyor chains, cat chains, tipple draglines, etc., too numerous to list.

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FOR SALE

COAL AUGER

COMPTON Model 48, Serial #6R-353-027-MG, 1953, 48″, Includes Hercules Auxiliary Engine for Hydraulic System, Kohler Light Plant, (8) 48″ and (5) 42″ Flights, Powered with 300 HP Cummins Model NHR1S-600 Diesel (2100 RPM) Engine, Electric Starting System, Will Drill 212′ into Coal Vein

VERTICAL DRILL AND COMPRESSOR

JOY Model 225, #6072, Combination Type, Equipped with Tandem Rear Duals & 5-Speed Trans, Powered with Cummins Diesel Engine, Mounted on 5 Ton White Model 1064 Truck Carrier

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Demonstrators and Rental Unit, some never titled or used, some slightly used. All on new or new recap Tires. From $4.250.00 up. Used single Axle Dump Trailers from ..... $500.00 up.
All in Excellent Condition.
Also 1961 models now available.
SPECIAL WINTER DISCOUNT IN EFFECT TILL FEBRUARY 1, 1961.

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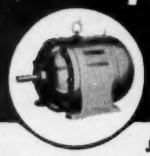

ON GUARANTEED NEW and Rebuilt MOTORS!

JAN. SPECIALS
GUARANTEED REBUILT MOTORS
230 Volt DC Compound Wound
Unless Otherwise Noted

HP	MAKE	TYPE	SPEED
150	G.E.S.B. Open	RC	900
100	Wes. S.B. Open	SK-142L	1800
100	Wes. S.B. Open	SK-170	900
100	CW TEFC BB	53 HFC	900
75	Wes. S.B. Open	SK-140L	1800
75	Wes. S.B. Open	SK-160	900
60	GEBB Drip	CDM-95	1800
60	Al. Chal. S.B. D	DE-131	1200
40	L.A.B.B. Splash	FNA-405	1800
40	Gen. BB D Nw	DN-375	1800
30	Wes. BB D. N	SK-93	1800
30	L.A.B.B. Drip	OGNA-404	1800
25	Cont. B.B. Drip	D-364	1800
25	GEBB Shunt	CD-93	1200
10	Wes. B.B. Drip	CSP-324	1800
7½	GE TEFCBB No	B-284	1800
5	G.E. B.B. Drip	B-254	1800

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Large line of motors, control equipment, AC & DC Generators, MG sets and transformers.

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DRAGLINES, SHOVELS, CRANES, DRILLS, TRUCKS

15-W B.E. Elec. Drag, 215′, 12 yd.
450-W B.E. Diesel Drag, 165′ w/extra 10, 12, 13 & 14 yd. buckets.
9-W B.E. Elec. Drag, 165′, 10 yd.
9-W B.E. Diesel Drag, 165′ 12 yd.
7-W B.E. Diesel Drag, 140′, 7 yd.
7400 Marion Diesel Drag, 175′, 13 yd.
71-B B.E. Crane with 160′ boom
625 Page Diesel Drag, 150′, 10 yd.
1855 P&H Diesel Drag, 130′, 10 yd.
821-B Page Diesel Drag, 125′, 7 yd.
200-W B.E. Diesel Drag, 125′, 6 yd.
2400 Lima Elec. Drag, 130′, 6 yd.
2400 Lima Diesel Drag, 130′, 6 yd.
4500 Manitowoc Drag, 120′, 5 yd.
120-B B.E. Elec. Drag, 115′, 5 yd.
111-M Marion Drag, 100′, 4 yd.
1055 P&H Diesel Drag, 80′, 4 yd.
1601 Lima 4 yd. Shovel/Drag
3900, 3500 & 3000 Manitowoc Cranes
5560 Marion 36 yd. Elec. Shovel
5323 Marion 18 yd. Elec. Shovel
190-B B.E. 8 yd. Elec. Shovel
151-M Marion 7 yd. Elec. Shovel
1600 P&H 6 yd. Elec. Shovels
170-B B.E. 6 yd. Elec. Shovel
4161 Marion 6 yd. Elec. Shovel
2400 Lima 6 yd. Std. & H.L. Shovels
120-B B.E. & 4121 Marion 4 yd. Elec. Shovels
4500 Manitowoc 5 yd. H.L. Shovel
1055 P&H 3 yd. H.L. Shovel
1201 Lima 3½ yd. Standard Shovel
111-M Marion Standard & H.L. Shovels
3500 Manitowoc Standard & H.L. Shovels
54-B B.E. Standard & H.L. Shovels
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Ingersoll-Rand Truck Mtd. & Crawler Mtd. Drill-masters
Keystone ±50 Truck Mtd. Starderill
McCarthy & Compton Coal Auger Drills
Euclid Trucks, Dozers, Attachments, etc.

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All makes and Models
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6—Joy 14BU 9AE—26″ Hi—New 1958.
3—Joy 14BU Loaders, low pedestal, 7AE, 1956 & 57.
6—Joy 14BU Loaders, medium pedestal, 7RBE.
1—Joy 14BU 7CE high pedestal loader.
4—Joy 14BU 3PE Loaders.
2—Joy 12BU Loaders complete with Piggybacks.
2—Joy 12BU Loaders, 9E, latest type, 250 V. DC.
5—Joy 12BU Loaders, 220/440 Volt AC.
1—Joy 20BU Loader, latest type.
4—Joy 11BU Loaders, latest type.
1—Joy 8BU Loader, 34″ overall height.
2—Joy 8BU Loaders, 220 V. AC.
1—Joy curved Bar Head for 14BU, complete.
6—Reliance 24-J Motors, 7½ H.P.
4—Reliance 38-J Motors, 10 H.P.
20—9-J Motors, 4 H.P.
2—Goodman 660 Loaders on Crawlers 440 V. AC, like new.
1—Goodman 660 Loader on Crawlers, excellent 250 V. D.C.
1—Goodman 665 Loader on Crawlers, latest type 250 V. DC.
1—Goodman 865 Loader, 26″ hi. Rebuilt. 250 V DC.
4—Joy 8SC Shuttle Cars, rebuilt.
4—Joy 6SC Shuttle Cars, rebuilt, latest type.
1—Joy 5SC Shuttle Car. Excellent.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars, rebuilt.
6—Joy 32E15 Shuttle Cars, rebuilt.
4—Joy 32E16 Shuttle Cars, rebuilt.
10—Joy 42E16 Shuttle Cars, rebuilt.
1—Joy CD-22 Drill, on rubber, like new.
6—Joy T-2-5 low pan Crawler Trucks, rebuilt.
1—Joy T-2-6 low pan Crawler Truck with reel.
2—Joy T-1 Standard Crawler Trucks, 220 AC.
1—Joy T-1 Standard Crawler Truck, 250 DC.
4—Joy 11-B Cutting Mach., like new, 35 & 50 H.P.
1—Joy 7-B Cutting Machine, like new, 250 V. DC.
2—Goodman 212 Cutting Machines, 19″ high.
1—Goodman 312 Cutting Machine, 17″ high.
3—Goodman 412 Cutting Machines, 19″ high.
1—Goodman Machine on Crawler, 31″ high. All hydraulic.
6—Goodman 512 Machines with Bugdusters.
6—Goodman 612 Cutting Machines, 250 and 500 V.
1—Jeffrey 70 URB rubber tired Cutter, Universal head, perfect condition.
1—Goodman 2410 Rubber Tired Cutter, Universal head, like new.
3—Joy 11RU Rubber Tired Cutters with bugdusters, Universal heads, dual tires, like new. 250 V. D.C.
2—Joy 10RU Rubber Tired Cutters, Universal head, 220/440 V. A.C. Perfect.
4—Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C.
6—7AU's on track. Universal head.
2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38″ high, on Crawlers, 250 volt D.C.
1—Jeffrey 29LC on Crawlers, rebuilt.

LOCOMOTIVES

1—Goodman 6 ton, 93-A, 27″ high, armor plate frame.
1—Jeffrey 15 ton MH-77 Locomotive, armor plate frame.
3—Jeffrey, 13 ton, type MH-110, 36″, 42″, 44″ ga.
2—Jeffrey, 10 ton, type MH-110, 42″ and 44″ ga.
2—Jeffrey, 10 ton, type MH-78, 42″ and 44″ ga.
2—Goodman 8-30 and 10-30 Locos., 26″ above rail.
1—Jeffrey MH-121, 4 ton, like new, with reel, 24″ overall height.
2—Jeffrey MH-150, 6 ton, 26″ overall height, rebuilt, with reel.
12—Jeffrey, 6 ton, type MH-88, 42″, 44″ and 48″ ga.
4—Jeffrey, 8 ton, type MH-100 2½″ armor plate frames.
1—Jeffrey, 6 ton, type 2186, 22″ above rail.
3—Jeffrey, 4 ton, type MH-96, 42″, 44″, 48″ ga.
1—G.E., 4 ton, type 825 Locomotive, 22″ high.
10—G.E., 6 ton, types 801, 803, 821 Locomotives, 42″, 44″ and 48″ ga.
1—G.E., 8 ton, type 822 Locomotive, 44″ ga.
3—G.E., 10 ton, type 809 Locomotives, 42″, 44″ and 48″ ga.
2—G.E. 13 ton, type 829 Locomotives, armor plate frames.
1—Goodman 91A Locomotive, 8 ton, 26″ overall height.
2—Goodman, type 33, 6 ton, 44″ and 48″ ga.
3—Westinghouse, type 902, 4 ton, 42″ and 48″ ga.
2—Atlas Battery Locomotives 36″ ga.
1—Atlas Trolley Locomotive, 4 ton, 24″ high.
1—Ironton Battery Locomotive, 4 ton, 24″ high, excellent, with charger.
2—Westinghouse, type 904, 6 ton, 44″ and 48″ ga.
2—Westinghouse, type 906, 44″ and 48″ ga.
2—Westinghouse, type 907, 10 ton, 44″ & 48″ ga.
8—Jeffrey MH-78 Locomotive Units, cheap.
4—Jeffrey MH-88 Locomotive Units, real bargains.
6—Jeffrey MH-100 Locomotive Units, reasonable.
3—Plymouth Diesel Locomotives, 8 and 10 tons, 42″ and 44″ ga.
Locomotive Trucks & Spare Armatures for the above.

TIPPLE EQUIPMENT

1—All Steel 5 Track Tipple, new 1957, complete with washer, silo, oil treating system, all bolted construction.
1—Complete Five Track Tipple with Washers and Air Tables.
1—Complete stoker plant, all steel.
2—Complete Tipples, 3 & 5 track, steel and wood.
3—Cleaning Plants, 1 Ea. McNally, Roberts and Schaefer, Jeffrey, Washers and Air-Flo Tables.
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3—Complete Rope and Button Lines.
2—Monitor Lines complete with Drums, excellent.
1—Allis-Chalmers 5′ x 12′ Rippflo Vibrator.
1—Allis-Chalmers 4′ x 12′ Low-Head Vibrator.
1—Robins Gyrex Vibrator, 4 x 10.
10—Belt and Apron type Loading Booms.
6—Shaker Screens.
1—Robins Car Shakeout.
20—Crushers, various sizes—Jeffrey, McLanahan & McNally.
4—Mine Scales, 10 & 20 ton.
5—Truck Scales, 25 to 40 ton, late type.
Feeders, Belt and Drag Conveyors, Car Retarders.

CUTTING MACHINES

1—Joy 10RU Rubber Tired Cutter, Universal head 220/440 volt A.C. Perfect.
3—Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C.
2—Joy 11RU Rubber Tired Cutters, 250 V. D.C.
1—Goodman 2410 Rubber Tired Cutter, Universal head, new 1956. Excellent.
2—Jeffrey 29UC Universal Machines on Crawlers.
1—Goodman on Crawlers, 31″ overall height.
3—Baby Goodman 212's, rebuilt, 250 V. D.C.
7—Goodman 212 Cutting Machines, 19″ high.
4—Goodman 312 Cutting Machines, 17″ high.
3—Goodman 412 Cutting Machines, 19″ high.
6—Goodman 512's, with Bugdusters, like new.
4—Goodman 512's, rebuilt, or as removed from service.
6—Goodman 612's—250 & 500 Volt.
3—Goodman 112's, 220/440 V. A.C.
1—Joy 7-B Cutting Machine, 250 V. D.C.
4—Joy 11B Cutting Machines, rebuilt, 35 & 50 H.P.
6—7AU's, on track, Universal Head.
10—Goodman 12AA's and 112AA's, 250 V. D.C.
2—Goodman 324 Slabbers.
2—Goodman 724 Slabbers.
2—Goodman 824 Slabbers.
6—Jeffrey 35L's, like new, 250 V. D.C., 17″ high.
2—Jeffrey 35L's, on low vein trucks.
2—Jeffrey 35L's 220/440 A.C.
3—Jeffrey 35BB's, 220/440 A.C.
15—Jeffrey 35B's and 35BB's 250 V. D.C.
2—Jeffrey 29B's on track.
10—Jeffrey 29C's, track mounted.
2—Jeffrey 29L's, on Crawlers. Excellent.
1—Sullivan CE7, 220/440 V. A.C.

CONVEYORS

2—Goodman 97HC 30″ & 36″ Rope Belts, 1600′ perfect. With or without rubber.
2—Jeffrey 52-B tandem drive 30″ Belt Conveyors, 1,500′.
1—Jeffrey 52-B tandem drive 26″ Belt Conveyor.
1—Joy 30″ Underground Belt Conveyor. Excellent.
1—Goodman 97-C, 30″ tandem drive.
1—Goodman 97-C, 26″ Conveyor, 1,000′ long.
1—Robins 36″ tandem drive, with or without structure.
1,200′ Robins 36″ Underground Structure, like new.
1,000′ Conveyor Belt, 42″.
4,000′ Conveyor Belt, 36″.
3,000′ Conveyor Belt, 30″.
4,000′ Conveyor Belt, 26″.
8—Jeffrey 61AM 12″ Chain Conveyors, 300′.
2—61EW Elevating Conveyors.
2—61WH 15″ Room Conveyors, 300′.
2—Joy 15″ Room Conveyors, 300′.
2—Joy 20″ Conveyors, 300′.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.
1,000′ Goodman 18″ Flat Belt Conveyors, tandem drive any length. Perfect.

CONVERTERS AND DIESEL PLANTS

1—300KW Portable Rectifier, 3 car unit, excellent.
2—500KW G.E. Stationary Rectifiers.
4—1,000KW Stationary Rectifiers.
2—100KW, G.E. TCC-6's, 275 V., Rotary Converters.
1—150KW, G.E. HCC-6, 275 V., Rotary Converter.
1—150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 V. D.C.
2—200KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Steel frames. Newly rewound.
3—300KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Like New.
2—300KW Westinghouse, 6 phase, Rotary Converters, 275 V. D.C.
2—500KW West. Rotary Converters, 275 V. D.C.
2—200KW Westinghouse Rotary Converters, 275 V. D.C. Newly rewound.
(All the above with 6900/13000 and/or 2300/4000 primary transformers)
2—100KW MG Sets, 275 V. D.C.
2—150KW MG Sets, G.E. and West., 275 V. D.C.
1—200KW MG Set, West., rebuilt, 275 V. D.C.
1—200KW MG Set, G.E., perfect, 275 V. D.C.
2—300KW G.E. MG Sets, like new.
1—300KW Westinghouse, 600 volt MG Set, rebuilt.
2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
2—500KW Westinghouse, 600 volt, D.C., 6 phase, Rotary Converters.
2—500 KW HCC-6's, Rotary Converters, 6 phase, 600 V. D.C.
1—GMC-471 Diesel with 60KW, 250 V. D.C. Gen.
3—GMC-671 Diesels with 75KW, and 110KW, 250 V. D.C. Gen.

LOADING MACHINES

16—Joy Loaders, 14BU, 12BU, 8BU, 11BU, 20BU.
5—Joy 12BU9E Loaders, 220/440 V. A.C. Excellent.
3—Joy 12BU9E Loaders, latest type.
2—Joy 12BU with Piggyback Conveyors.
2—Goodman 865 Loaders, 26″, on Crawlers.
1—Goodman 665 Loader, on Crawlers, rebuilt.
2—Goodman 660 Loaders, 440 V. A.C., perfect.
1—Goodman 660 Loader, on Crawlers, 250 V. D.C.
1—Goodman 460, on track, rebuilt, all hydraulic.
2—Jeffrey 61 CLR's on rubber, 26″.
3—Jeffrey L-500 Loaders.
2—Myers Whaley, No. 3 Automatic Loaders.
2—Clarkson Loaders, 26″ above rail.

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1—Complete Five Track Tipple with Washers and Air Tables.
5—Complete Tipples, 3 to 5 Track. Wood and Steel.
Steel Trestles for drop bottom cars.
All Steel Armco Buildings.
20—Jeffrey Molveyors on rubber tires.
1—¾ Yard Shovel and Back-Hoe.
1—¾ Yard Crawler Crane.
Battery Supply Tractors, Rubber Tired.
1—Cantrell Air Compressor on rubber tires.
10 Air Compressors, 1 H.P. to 40 H.P.
2—Joy self-propelled rubber tired comp., 240 cu. ft.
2—Acme self-propelled rubber tired compressors, 130 cu. ft.
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1—Differential 40 Passenger Man-Trip Car.
6—MSA Rock Dusters.
2—Philips Carriers, 44″ and 48″ ga.
1—Barber-Greene self-propelled Bucket Elevator.
Pipe, Plastic, Steel, Transit, all sizes 1″ to 6″.
25,000 Roof bolts, all types.
300—Mine Cars, drop bottom, 42″ ga.
90—Mine Cars, drop bottom, 44″ ga.
50—Mine Cars, drop bottom, 48″ ga.
100—Mine Cars, 18″ high, end dump, 44″ ga.
300—Mine Cars, end dump and drop bottom, 20″ high, 48″ ga.
1—10 ton Mine Car Scale with Recorder.
4—Brown Fayro 15 HP latest type Hoists.
15—Brown Fayro HKL and HG Car Spotters.
1—Brown Fayro Hydraulic Car Spotter.
1—12 ton Differential Slate Larry.
Incline Hoists, 25 to 50 H.P.
1—Jeffrey 5′ Aerodyne Fan, like new.
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2—Storage Tanks, 4,000 Gallons.
2—Storage Tanks, 10,000 Gallons.
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2,500 tons Relaying Rail, 25lb., 30lb., 40lb., 50lb., 60lb., 70lb.
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600—MSA Mine Lamps, Chargers, etc.
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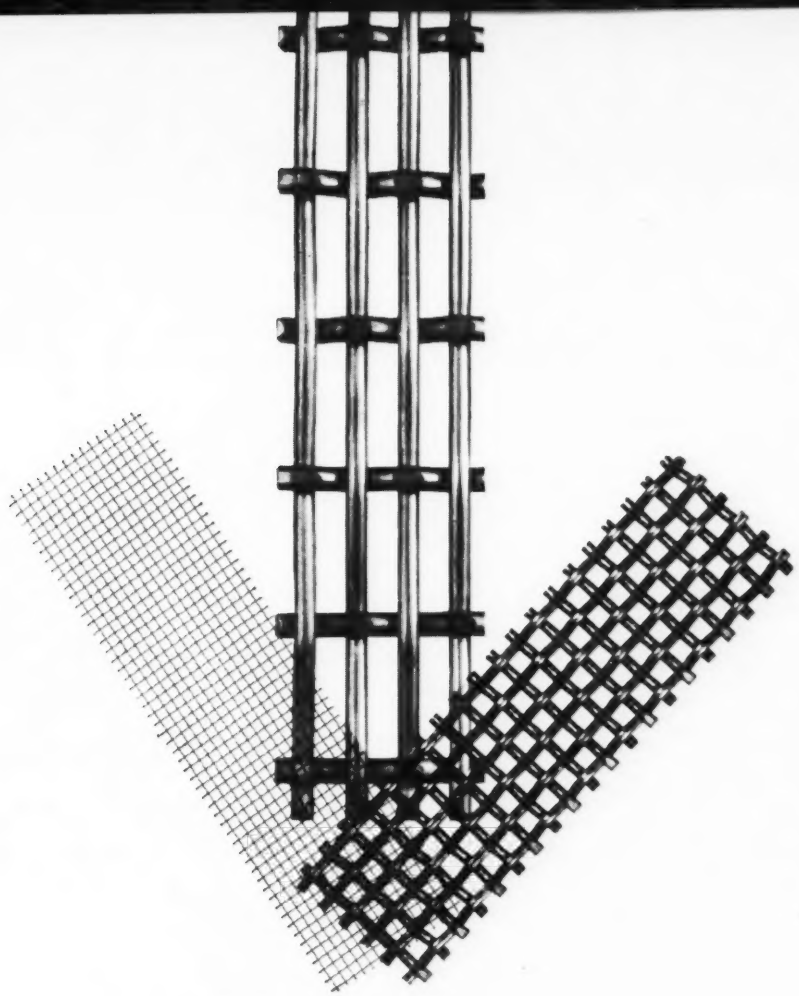

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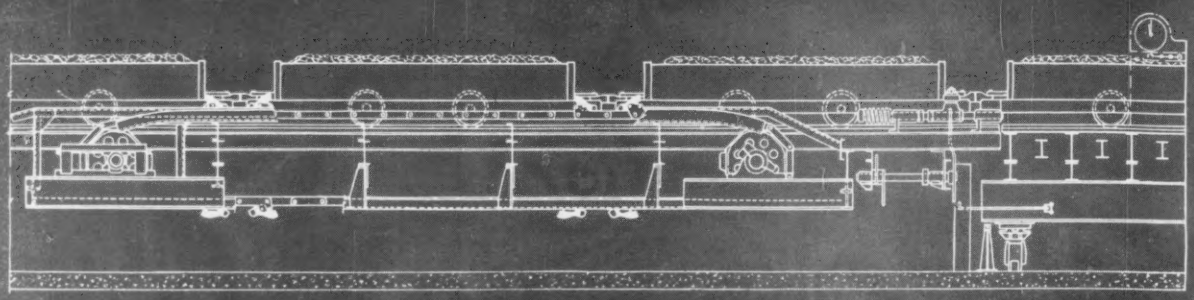

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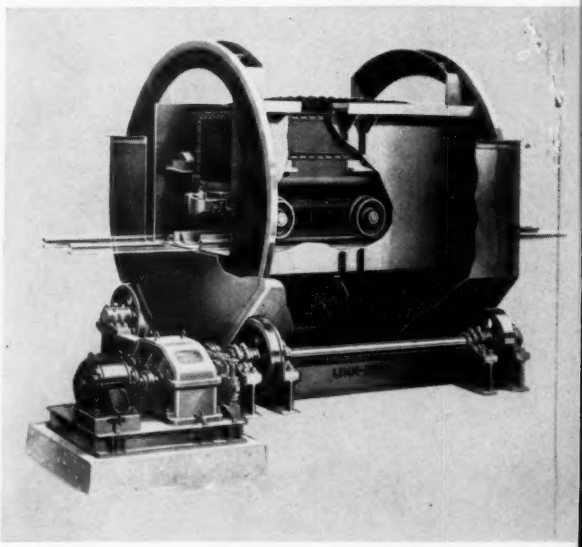

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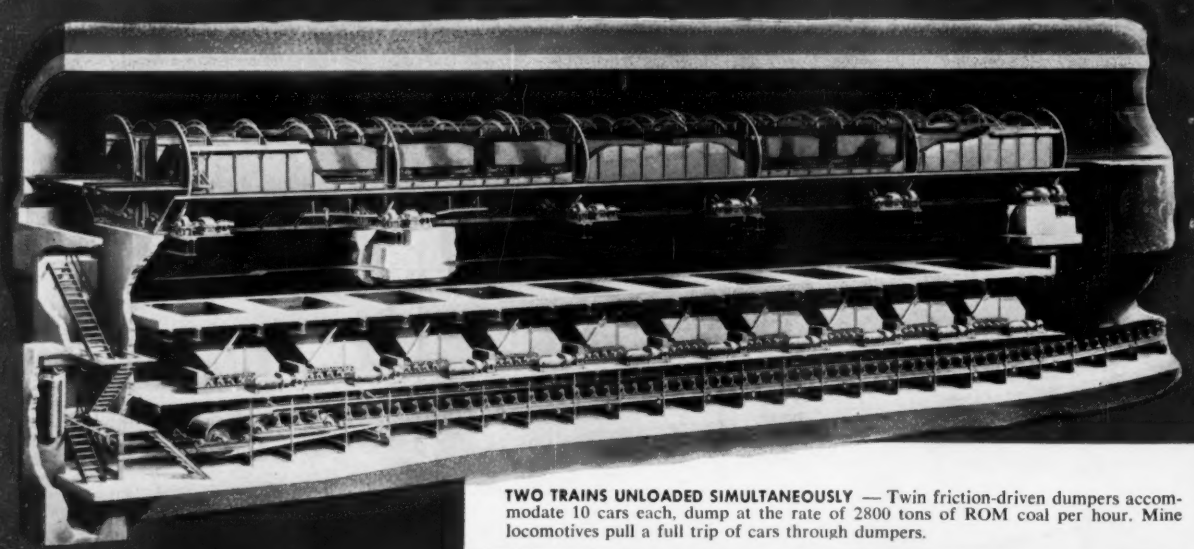
COAL PREPARATION AND HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Birmingham 9, Cleveland 20, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 8, Pittsburgh 13, Seattle 4, St. Louis 1. To Serve Industry There are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.



TWO TRAINS UNLOADED SIMULTANEOUSLY — Twin friction-driven dumpers accommodate 10 cars each, dump at the rate of 2800 tons of ROM coal per hour. Mine locomotives pull a full trip of cars through dumpers.